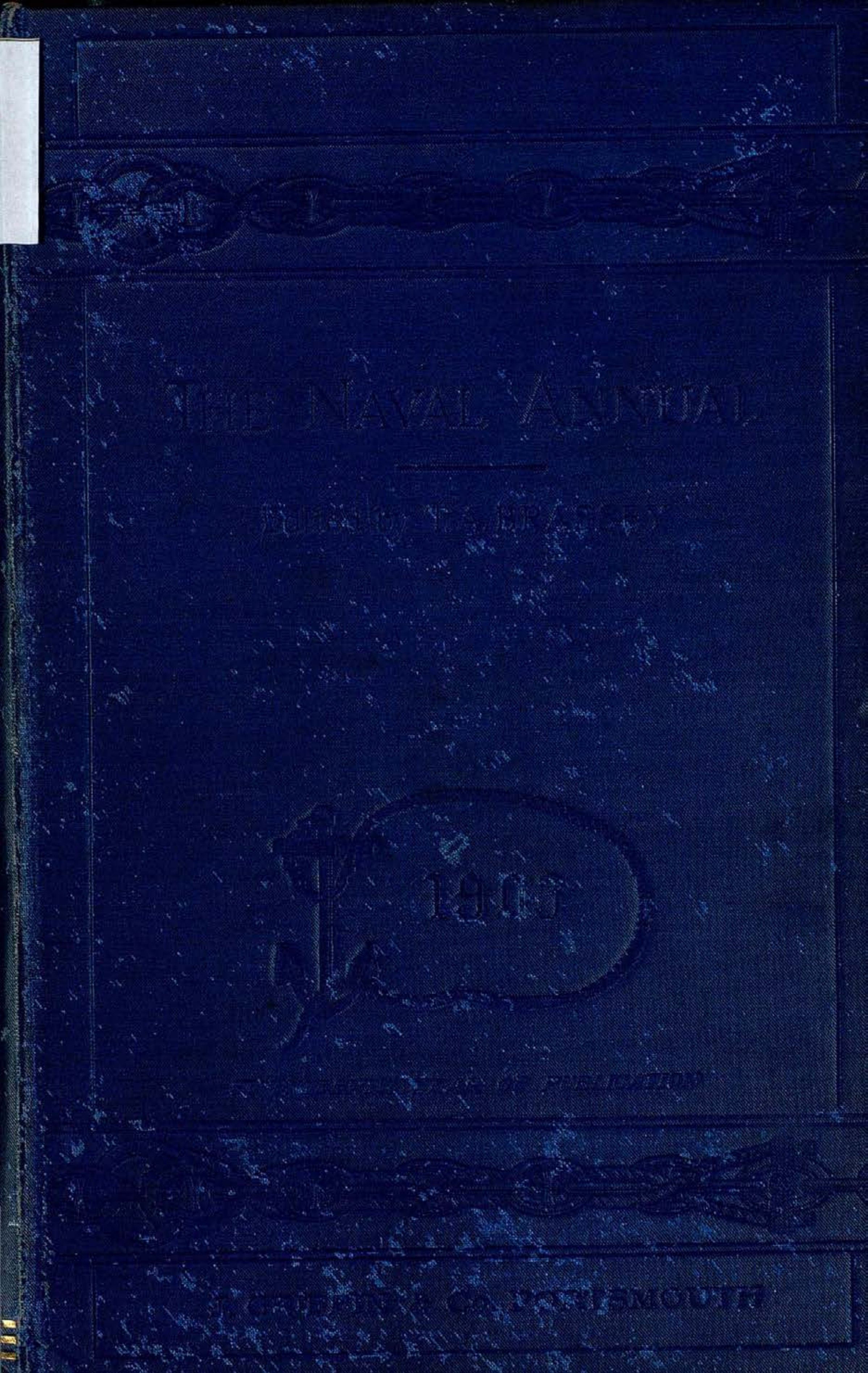
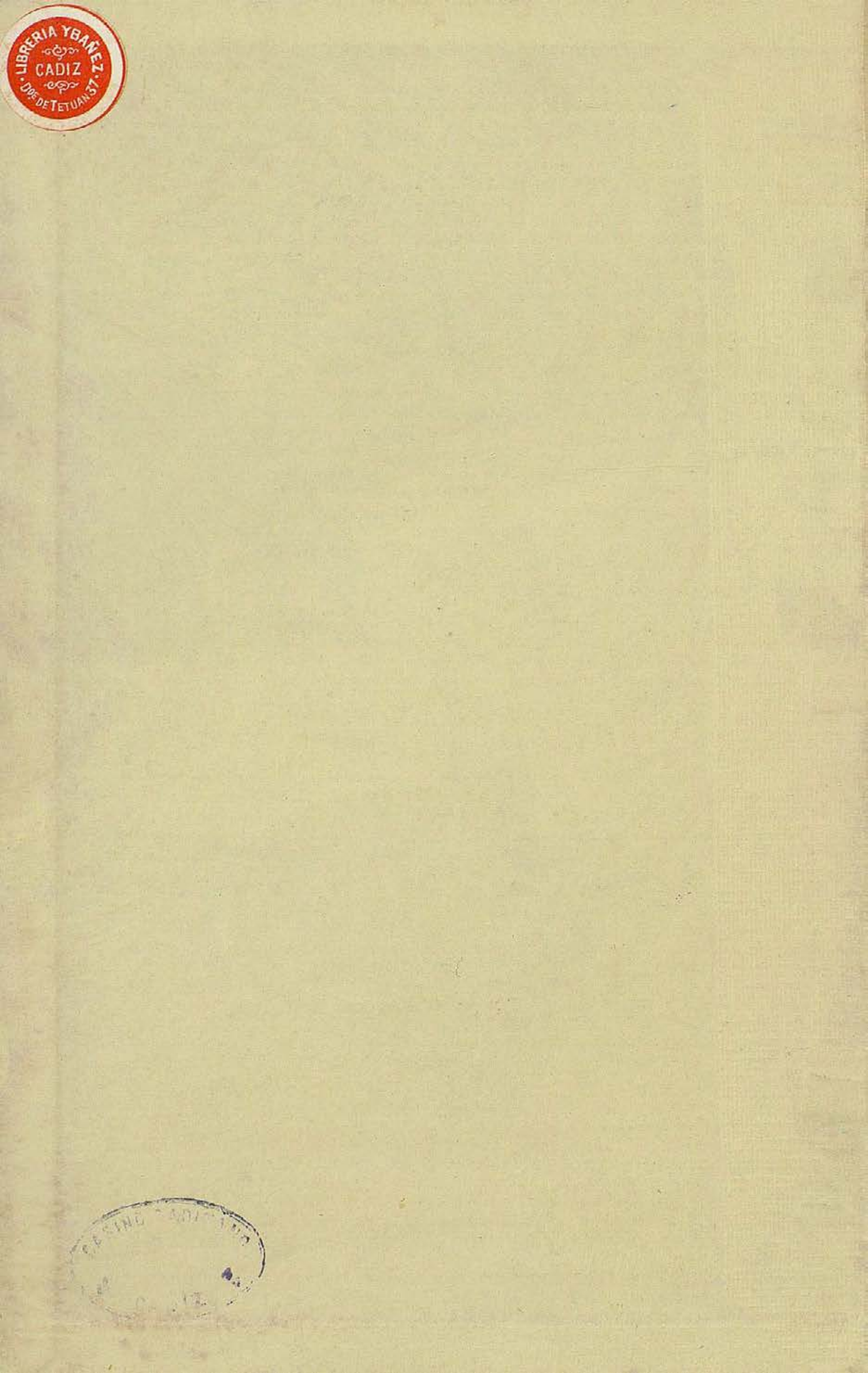
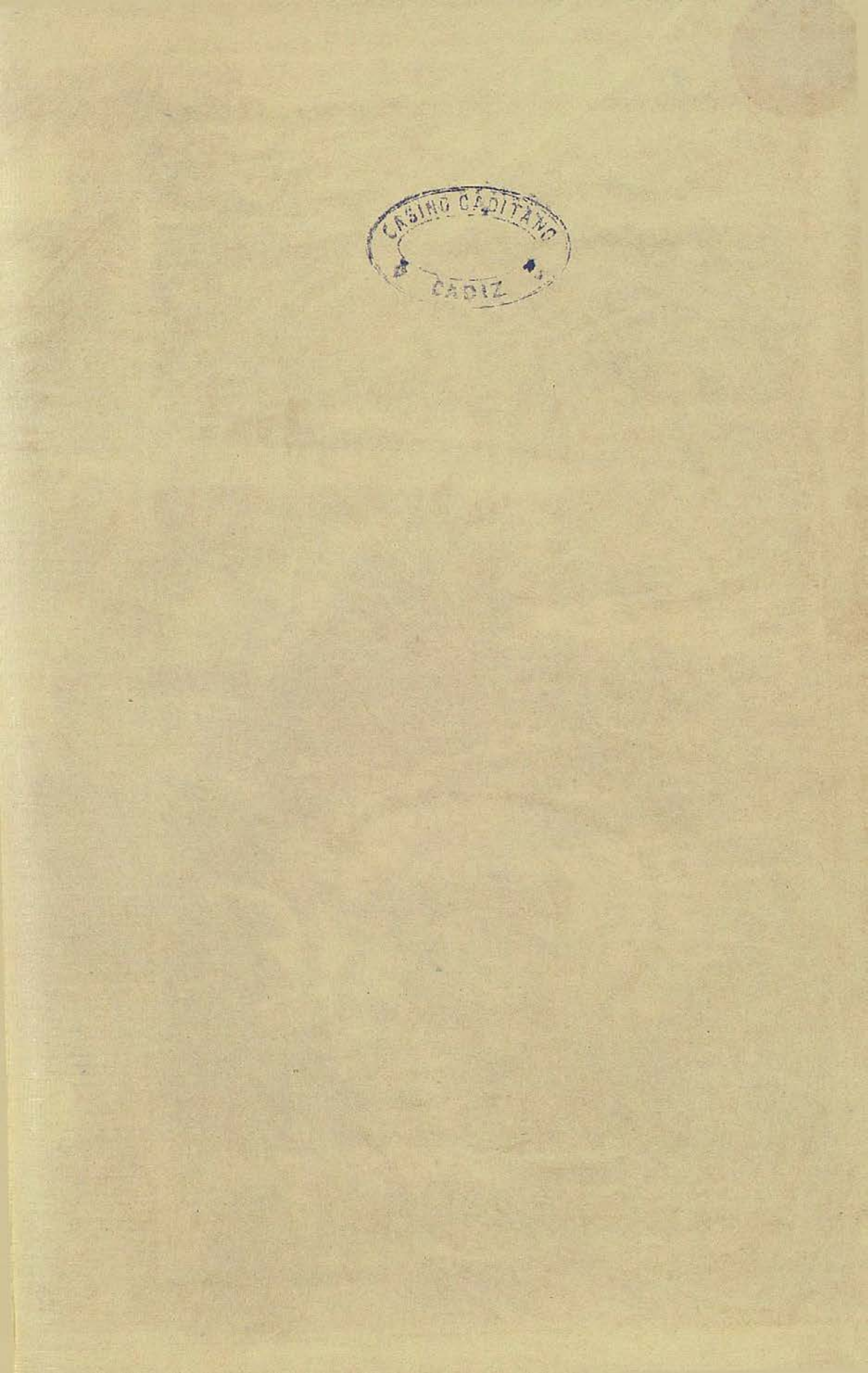
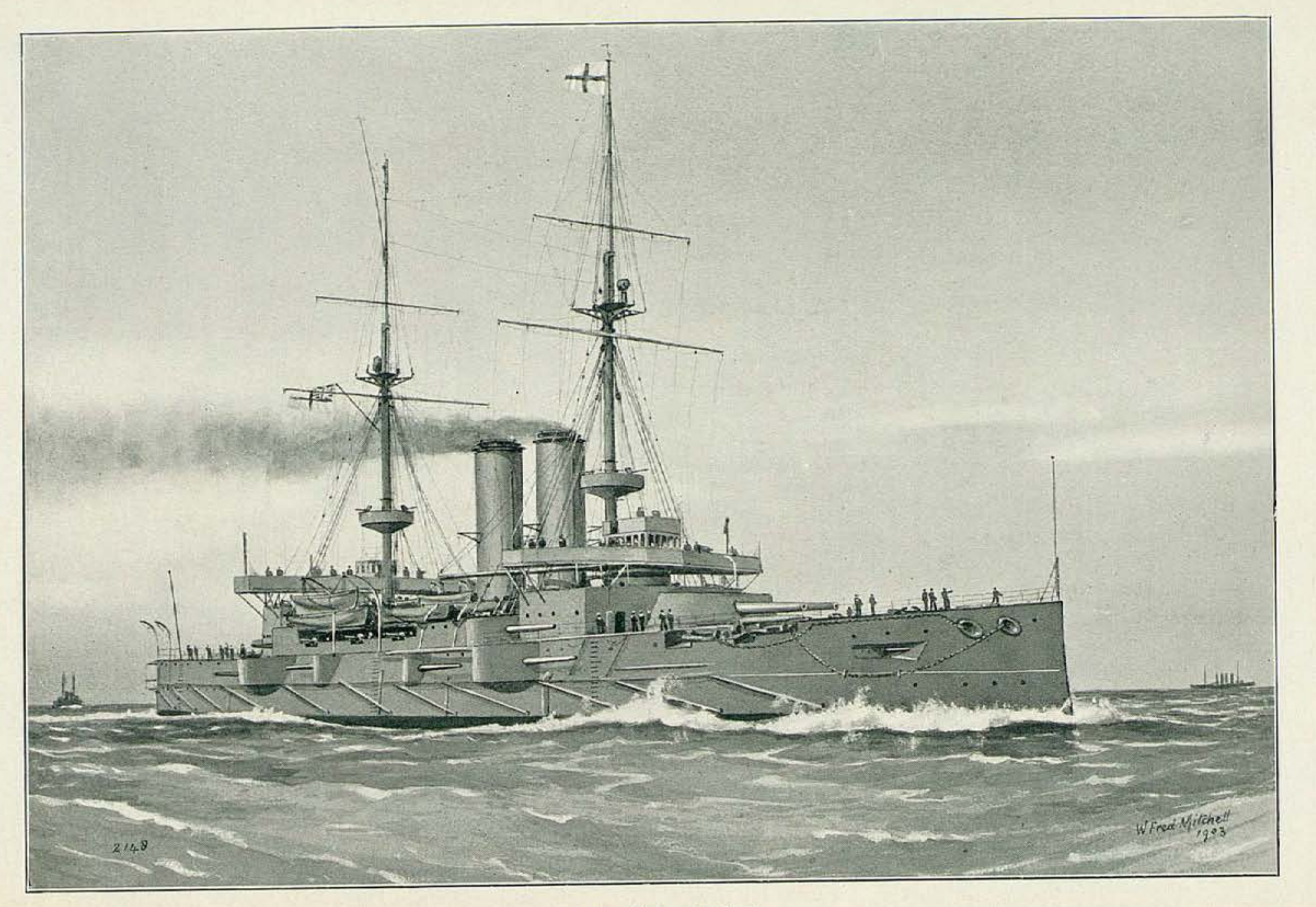

THE NAVAL ANNUAL
1907
PORTSMOUTH


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H.M.S. "RUSSELL."

THE

NAVAL ANNUAL,

1903.

EDITED BY

T. A. BRASSEY.

"Let us be back'd [illegible], and with the seas
Which He hath [illegible] impregnable,
And with [illegible] defend ourselves;
In them [illegible] our safety lies."—*Henry VI.*

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PART II.—[illegible] Commander C. N. ROBINSON, R.N., and [illegible] S. W. BARNABY.

PART III.—[illegible] and [illegible] Tables.

PART IV.—[illegible] BRITISH AND FOREIGN [illegible] *PERSONNEL.*

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[illegible] QUEEN VICTORIA.]

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PART II.—Lists of Ships: Commander C. N. ROBINSON, R.N., and JOHN LEYLAND; Plates: S. W. BARNABY.

PART III.—Armour; Ordnance and Ordnance Tables.

PART IV.—FIRST LORD'S MEMORANDUM; BRITISH AND FOREIGN NAVY ESTIMATES; STATISTICS OF *PERSONNEL.*

1903.

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PREFACE.

The Navy Estimates for 1902–3—the year reviewed in the present number of the *Naval Annual*—amounted to £31,255,500. The Navy Estimates for 1903–4 amount to £34,457,500—an increase on the net Estimates of the previous year of £3,202,000. The principal heads of increase are under the votes (1 and 2) for *personnel*, £619,800; the ship-building votes, £2,336,000; and the works vote, £402,000. The large and continued increase in the Estimates for the Navy, accompanied as it is by a heavy increase in the Army Estimates, will, we fear, produce a reaction which will have most serious consequences on the future defence of the Empire. The results of recent bye-elections may be taken as some indication that such a reaction has begun, and that the electorate does not approve the unchecked growth of public expenditure. The founder and the present Editor of the *Naval Annual* have consistently urged in these pages that it is unwise for those responsible for the administration of the Navy to take full advantage of the liberality of Parliament. We have pointed out again and again that Great Britain is practically maintaining her Fleet on a war footing in time of peace.

Nearly all our effective battleships are in commission. Additions have been recently made to the battleship strength of the British Mediterranean Fleet which are not justified by the increase in the preparations of our possible enemies in Mediterranean waters, for the French have a smaller force in commission and in reserve than they had a few years ago. During the past year the coast-guard and port-guard ships have been organised into the Home Squadron with full complements. For many years the manning requirements of the Navy have been met by additions to the permanent force, and no serious attempt has been made to increase our Naval Reserves. Our manning policy compels us to keep a large number of ships in commission in time of peace, in order to give the necessary training to the increased *personnel*. It has thrown a heavy burden on the resources of the country, the financial effects of which on the charge for pensions are as yet hardly felt.

In another direction our policy is equally extravagant. Immense

sums of money are being lavished on naval works; and while at Portsmouth and at Chatham obsolete ships crowd the basins and building slips are empty, it is proposed to establish another dockyard on the Firth of Forth.

It is idle to criticise expenditure unless the direction in which economies can be made is pointed out. No economies should be accepted which would imperil the vital interests of the country in the command of the sea. In view of the exertions being made elsewhere, little reduction in the ship-building vote is possible. Economies—and very large economies—could be made by reducing the number of men in the permanent force, by the creation of an adequate reserve, and by restricting the excessive expenditure on naval works. It is only in the last ten years, and largely through the lessons learned from Captain Mahan, that the people of this country have come to realise the importance of the Navy. Money has been freely voted for the Navy by the representatives of the people in Parliament. The absence of criticism has led to extravagance. The present Board of Admiralty have done much to improve the efficiency of the Navy, but while cordially recognising the attention given to the development of Naval Reserves, we regret the addition proposed this year to the manning vote.

In Part I., in addition to the usual chapters dealing with the Progress of the Navies of the World, Comparative Strength, Manœuvres, and Marine Engineering, the New Naval Scheme of Entry and Training is discussed from independent points of view by Admiral Sir Vesey Hamilton and Mr. Carlyon Bellairs. As pointed out in Chapter I., we look upon the new scheme with considerable misgiving. Submarine Cables and Naval Works seemed subjects which required special consideration. For the chapter on Naval Works, plans have been kindly furnished by the Admiralty. Lord Brassey's general review of the position is printed as an introduction.

In the lists of ships, in Part II., important changes have been made which have involved the recasting of the whole of the tables. The object of the changes has been to eliminate information which has ceased to have much value, and to substitute more useful particulars. The column giving the material of hull has been struck out, as all ships are now built of steel. We have also omitted the column giving the number of propellers, because few ships are now fitted with a single screw. The inches in the dimensions columns are given in fractions of a foot, which does not admit of an error of more than an inch. With the space thus saved we are able to give a column for the date of completion as well as launch, and to allot two columns for additional information as to armour. The

calibre of guns in the armament column is printed in italics. We trust that these alterations will be appreciated. Captain Robinson and Mr. Leyland, who are responsible for these tables, as well as the Editor, would be exceedingly glad if our readers would write to inform us of any errors they may detect. The diagrams of ships in Part II. have been rearranged. The battleships and the cruisers of each country are kept together and placed in order of date. We regret that the Admiralty have refused, for the first time for some years, to give us drawings of new ships.

Part. III. remains in the same hands as last year.

Part IV., in addition to the usual information, contains the Admiralty Memorandum on the New Scheme and the Draft Agreement adopted at the Colonial Conference. An attempt has also been made to estimate the manning resources and to give in tabular form the systems of service in the different navies. It has been urged that in Part IV. should be reprinted selected foreign naval documents, such as the Report of the Secretary of the United States Navy, and the Report of the French Budget Committee, as well as the reports of important committees, such as that on Naval Reserves. This would involve either a large addition to the size of the volume or the omission of a number of the articles in Part I. We should be glad to have the opinion of our critics on the desirability of such a change in the character of the *Naval Annual*, which was founded mainly for the purpose of being of value to the naval officer.

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INTRODUCTION.

THE British Navy Estimates for 1903–4 amount to £34,457,000, as against £31,225,000 for the previous year. Heavy increases of expenditure for warlike preparations are a strange sequel to the conclusion of peace. The policy on which we have entered is not the policy on which the great statesmen of the past—Lord Beaconsfield not less earnestly than Mr. Gladstone—insisted. During the Russo-Turkish war Navy Estimates had been considerably increased. At the close of the war our expenditure was cut down to the greatly reduced figures which Lord Northbrook's Board inherited from their predecessors. Lord Beaconsfield's method of dealing with the Navy seems wiser in its application to the present time than it appeared to those at the Admiralty a quarter of a century ago, when an increase of the Navy was needed and funds were scanty. Our present expenditure is increasing beyond all precedent. The severe and costly struggle in South Africa has been brought at last to a successful issue. All the great Powers of Europe are solicitous for peace, and are feeling the financial strain of costly armaments. Is our proposed expenditure necessary? Can our present charges be borne without detriment to the national progress and prosperity? Observations on Navy Estimates, 1903–4.

In his speech at Bristol in September last, Sir Michael Hicks-Beach expressed the opinion that a continued increase of expenditure, even for the Navy, was impossible. Our Navy Estimates had gone up in seven years from £18,700,000 to £32,500,000. The present Chancellor of the Exchequer has not thought it necessary to insist that the growth of naval expenditure should be checked. In a recent speech he said: "The most careful watch ought to be kept over the expenditure for the Navy. The money ought to be economically administered; but, taking it for granted that it is economically administered, I am quite sure that the country is ready to bear any expenditure that may be entailed upon it by maintaining the efficiency of the Navy." Recent elections suggest some doubt as to whether these assurances rest on full knowledge of what is passing in the popular mind. Thus far the burdens thrown upon the tax-payers have fallen lightly, except on the class which has to bear heavy charges for succession duty. Their condition is often pitiful. Necessity for economy.

The leading witnesses with Treasury experience who appeared before the Committee on National Expenditure, Sir George Murray and Lord Welby, expressed regret that it was the policy of Parliament to criticise expenditure less closely than formerly, and to urge the Executive Government to increased expenditure instead of the reverse.

British statesmen, and political parties of all shades, are agreed that our sea-power must be adequately sustained. They have studied the writings of Captain Mahan. His luminous narrative has shown convincingly the influence of sea-power on the course of history. The Memorandum which the Admiralty laid before the Colonial Conference was a masterly summary of the teachings of history from the earliest times. It showed how supremacy at sea has given control over communication, and has always made it impossible in war for the weaker Power to send a military expedition across the seas. We depend on the Navy for the protection of our commerce. These considerations enforce the necessity for efficiency. It may be promoted by economy, especially in those directions which are of merely local importance and exercise no direct influence in winning command of the sea. By wisely husbanding resources in peace, we may be possessed of more elastic resources in the contingency—which may Heaven avert—of a great naval war.

United States estimates.

In framing estimates for the British Navy we have chiefly to look to the policy of other Powers. We do not, however, regard the United States as a possible foe. No other Power—no combination of Powers—could vie with the people of the United States, if it were their policy to employ their unrivalled and rapidly growing resources in the creation of a predominant navy. Their own position is impregnable. They are self-contained, and their situation does not compel them to divert expenditure to the defence of land frontiers. In her political relations with the United States, old England may confidently reckon that the claims of kinship will always prevail. Blood is thicker than water. Great Britain and the United States are bound to one another as no other nations are, by religion, race, language, and material interests. On many issues the two countries can work together and exert a commanding influence. It has been truly said by Captain Mahan, "in the control of the sea, the beneficent instrument that separates us that we may be better friends, will be found the object that neither the one nor the other can master, but which may not be beyond the conjoined energies of the race."

Comparison of estimates.

Our rivals—not necessarily unfriendly rivals—are nearer at hand. Sir John Colomb's return shows the expenditure for the British

Navy as approximately equal to that of France, Russia, and Germany. The figures are as under:—

BRITISH EMPIRE.	£
Navy Estimates, 1903–4	34,457,000
Expenditure under Naval Works Act, say	3,000,000
India (return of last session)	462,000
Australian Commonwealth	172,000
New Zealand	22,000
Cape of Good Hope	30,000
	38,143,000

The expenditure of other Powers for the year 1903 is as under:—

	£
Russia*	10,877,000
Germany	10,887,000
France	12,524,000
Total	34,288,000

* The amount is probably larger owing to extraordinary expenditure.

Navy estimates have grown rapidly in Russia and Germany. In France they have been stationary. Further increases may not be approved in France or Germany. M. Pelletan's defence of his policy in the Chamber was based entirely upon the arguments of the *jeune école*. It is useless, he said, to fight where the contest is a matter of millions. France has not such a long purse as her rivals, and, even if she could equal Great Britain, how could she enter the field if Germany and the United States were engaged in the conflict? He, therefore, dissents entirely from the advocates of the *grande guerre*.

Cost of construction, England and France.

We have seen that our aggregate expenditure exceeds that of the leading continental Powers combined, and we build far more cheaply than is possible in France and Russia. The British Majestic, 14,900 tons, cost, according to the Dockyard Expenses Account, £895,504; the Charlemagne, 11,108 tons, with a displacement less than that of the British battleship by 3800 tons, cost £1,096,432. The Majestic thus cost, with her armament, 39 per cent. less per ton than the Charlemagne. If we take the latest ships designed by Sir William White, the revised estimate for the London, of 15,000 tons, is £1,107,111. The estimated cost for the République class, 14,630 tons, is £1,431,013, and for the Patrie £1,602,048. The comparative cost in England and France has been minutely examined by the French ship-building officers. The committee of the French Chamber on the Navy Estimates for 1900 gave the result of their inquiries, with examples. The general results of an exhaustive comparison showed that for labour only the cost per ton was, for the English Navy,

£15 18*s.* 0*d.*; for the French, £22 3*s.* 0*d.* Materials, armour, hull and fittings cost for the English ships £22 4*s.* 0*d.* per ton; for the French, £37 2*s.* 0*d.* It is clear that the British Admiralty has an immense advantage in the active competition of their contractors, for the number on the Admiralty list is such that combination to keep up prices, as in France, is impossible.

Ship-building votes.

While the votes for manning show a large excess, in ship-building we have barely kept pace with the leading Powers. The expenditure for the five years 1898–1902, as given in the German Naval Annual, *Nauticus*, compares as under:—

	Total Navy Estimates.	Shipbuilding, including armaments.
	£	£
England	151,420,000	66,335,000
France	62,490,000	29,060,000
Russia	47,755,000	18,755,000
Germany	40,515,000	19,055,000
	150,760,000	66,870,000

Comparing the figures for 1898–1902, the total expenditure and the appropriation to ship-building were as under:—

	1902.		1898.	
	Total Navy Estimates.	New construction and armaments.	Total Navy Estimates.	New construction and armaments.
	£	£	£	£
England	33,025,000	14,610,000	25,625,000	10,415,000
France	12,640,000	6,115,000	11,620,000	5,530,000
Russia	10,815,000	4,060,000	7,485,000	3,005,000
Germany	10,250,000	5,150,000	6,105,000	2,565,000
	33,705,000	15,325,000	25,210,000	11,100,000
United States	16,100,000	7,235,000	11,785,000	4,450,000

For 1903–4 the ship-building votes for the British Navy provide for a total expenditure on new construction of £10,137,000, of which £1,150,000 will be devoted to the commencement of new ships. This makes an increase of nearly £1,100,000 over 1902–3. The increase brings us approximately to a level with the aggregate expenditure on ship-building, as proposed in the budgets of France, Russia, and Germany for 1902. We are bound to keep pace with rival Powers. It has been announced that when we see a pause elsewhere, as now in France, we stand ready to cut down the programme of building.

Resources have been greatly wasted in the building of ships, which, though as costly ton per ton as the most powerful types, have had to be put aside as obsolete almost as soon as they were completed. They were too small to hold the sea and too slow to give protection to trade. In coal endurance, armour, and armament they were miserably defective. It is due to the Constructive Department of the Admiralty to say that the newest designs offer little scope for criticism. In the designs for the battleships of the British Navy we have for many years past seen a steady improvement in speed, armament, and protection. The increased resisting power of armour has made it possible to reduce the thickness, and so to cover a larger area of side. In increase of dimensions, England has led the way. In our latest designs the displacement falls little short of 17,000 tons. The latest battleships designed for the United States, the Louisiana and the Connecticut, are approximately of the same tonnage. Increase of dimensions has been reluctantly accepted in the French Navy. Three ships have now been laid down, and three are proposed, having a displacement of 14,630 tons. The largest vessels building for Russia have a displacement of 13,516 tons. For Germany the largest ship in construction has a displacement of 12,792 tons. The French battleships, though inferior in displacement, are as costly as the British. **Types of ships. Battle-ships.**

In the types of battleships now building, we may rest confident that we get as good value for our money as the constructors of any other Power are able to give. There can be no more competent authority on this subject than Sir William White. In an article contributed to *Cassier's Magazine* he wrote as follows :—

"If the conditions of the problem were stated in identical terms to the leading warship designers of the world the results obtained would not differ greatly as regards the sizes of ships proposed to fulfil the conditions. Differences in proportions and forms there would be, no doubt. But the differences that exist in dimensions of existing warships, in comparable classes, must be chiefly assigned to differences in the conditions laid down to govern the designs. Any improvement which may be originated in one country in materials of construction, marine engineering, gunnery, torpedoes, explosives or armour do not, and from the nature of the case cannot, long remain solely in the hands of its originators. There is no monopoly of invention or technical skill. What has been accomplished in one country will speedily be rivalled, or perhaps temporarily excelled elsewhere."

In the cruiser class we have advanced to the dimensions of battleships. The Drake class have a displacement of 14,100 tons ; **Cruisers.**

the Tennessee and the Washington a displacement of 14,560 tons. The French cruisers of the Gambetta type have a displacement of 12,351 tons. In Russia, the large cruiser, formerly a conspicuous feature, has disappeared from the ship-building programme. The cruisers building for Germany are few and of the third-class. In Russia and Germany efforts are concentrated on battleships.

Distribution of ship-building expenditure.

Careful consideration should be given to the distribution of expenditure on ship-building, as between battleships and cruisers. At the commencement of the year the tonnage in construction for the British and other Navies compared as under:—

	Battleships.		Large Cruisers.	
	Numbers.	Displacement.	Numbers.	Displacement.
		Tons.		Tons.
Great Britain	10	156,000	22	221,800
France	6	89,200	8	92,800
Russia	6	87,900	3	20,000
Germany	6	76,400	3	27,600

Since the building of the Powerful and Terrible, British cruisers show an improvement of design surpassed in no other Navy. In the Duke of Edinburgh, the new type designed by Mr. Watts, the protection of a second-class and the armament of a first-class battleship are combined with the speed of a cruiser. We may be well content if the promise of over 22 knots is fulfilled at sea. Higher speeds can only be obtained by the sacrifice of fighting efficiency. For extreme speeds we should look to our mercantile auxiliaries. It is not a wise appropriation of naval votes to spend vast amounts to secure speed alone.

In cruisers of the first-class with speeds of 22 knots Great Britain has a substantial advantage. Completed or rapidly advancing to completion, we have ten ships of the Monmouth type, 9,800 tons; six Cressy, 12,000 tons: four Good Hope, 14,100 tons; six of the Devonshire class, 10,700 tons, now building. In 1903–4 it is proposed to commence four first-class armoured cruisers of the Duke of Edinburgh type, making six in all of this class. Of the seventeen French ships of even speed, one is completed, six are going through their trials, and three are not yet launched. Critics of naval administration in France complain that their Navy is inferior in the number, the power, and the speed of its cruisers, and that money has been wasted in building vessels too small to be effective.

COMPARATIVE STRENGTH.

Having given the expenditure, let us compare the naval forces of the Powers. Dealing first with the fleet ready for immediate service, our strength in ships in commission in European waters shows a decided superiority over any conceivable combination. France is the leading maritime Power of the continent, and the main strength of her Navy is concentrated in the Mediterranean. In European waters Great Britain has the Mediterranean, the Channel, the Home, the Reserve Fleets, and a cruiser squadron, already powerful, and in process of being rapidly reinforced. Near home our superiority is indisputable. In China our squadron is approximately equal to that of Russia in battleships and large cruisers, and the treaty recently negotiated with Japan secures the support of a powerful ally in case of need, with a fleet of six first-class battleships and six first-class cruisers. Ships in commission.

Turning from ships in commission to the lists of those built and building, the following figures are taken from the German Naval Annual, *Taschenbuch der Kriegsflotten*, compiled by Lieut. Weyer. They show the battle-fleets of the great Powers in 1907, that is to say, when all ships now building are completed. It should perhaps be noted that no allowance is made for the rumoured new Russian programme of six battleships. Ships built and building. Battle-ships.

	Ships.	Total tonnage.
Great Britain	54	749,000
France	31	345,000
Russia	26	303,000
France and Russia	57	648,000
United States	21	260,000
Germany	19	213,000

France, Russia and Germany aggregate 861,000 tons against 749,000 tons for Great Britain. If, however, we include the new and more powerful battleships about to be laid down in this country, we shall be more nearly equal in battleship tonnage to the combined strength of France, Russia and Germany.

Passing from battleships to cruisers, *Nauticus*, another German authority, the organ of the German Navy League, gives the following comparative table of cruisers over 5000 tons, launched in 1887 and subsequently:— Cruisers.

	Total number.	Armoured.	Aggregate tons displacement.
Great Britain	70	29	648,440
France	28	23	243,171
Russia	13	5	100,606
Germany	11	5	81,750

The comparative tables of the *Naval Annual*, which are a closer approximation to the survival of the fittest, give the following:

CRUISERS, BUILT AND BUILDING.

	First-class.	Second-class
Great Britain	38	40
France	14	15
Russia	3	13
Germany	5	6

We have an unchallenged superiority in all classes of cruisers, and not least in those of the most powerful type. We are much more than equal to France and Russia combined.

Reductions of foreign squadrons Small vessels.

The growth in the numbers and the cost of the permanent force have long been the cause of anxiety to First Lords of the Admiralty. I have referred to Lord George Hamilton's Memorandum, in which he insisted that a limit must be put to the increase of the numbers borne for the Navy in time of peace. His views have been shared by Lord Goschen. Reading between the lines, it is not difficult to interpret the mind of Lord Selborne in the same sense. In his Memorandum, now before us, he writes: "I trust that, as the result of the work of the Reserve Committee, a principle and standard in respect of the manning of the Navy will be adopted by the Board which will receive the seal of the concurrence of Parliament; but, in view of the constant demands that are made in various quarters that additional ships should be placed in commission, I wish to lay stress on the fact that the number of the active service ratings must continue to increase disproportionately to the growth of the reserves, unless a fairly constant ratio is observed between the ships in commission and the ships in reserve."

The need of concentrated forces.

These remarks of Lord Selborne bring up for very serious consideration the policy to be adopted in relation to the numbers and the distribution of ships in commission. The principles to be followed in order to make the most effective use of our sea power were ably expounded by the Admiralty in the Memorandum submitted to the members of the Colonial Conference of last year. The essential principle is concentration on the decisive points. The naval force of France is concentrated in the Mediterranean, that of Germany in Northern waters, that of Russia in the Far East. These dispositions determine those made by the British Admiralty. The wide extent of the British Empire, and the necessity of giving protection to commerce of immeasurable value, extending to every sea, impose on the Admiralty a responsibility such as falls to no other administration and justify naval expenditure largely exceeding that of the other maritime Powers of Europe. Confidence in the

patriotic resolve of Parliament to deal in no niggardly spirit with naval requirements should not, however, discourage those concerned in naval administration, whether from within or from without, in the effort to cut down expenditure where it is least necessary. To maintain naval forces, consisting of vessels useful only for peace services, in waters where we have no rivals is a waste of money. It is due to the Admiralty to recognise that the changes they have made in the distribution of the Fleet are in the right direction. The policy of concentration in home and European waters has been begun. Two depôt ships have been sold. One second-class cruiser from the Cape station, and a sloop from the south-east coast of America, have been withdrawn without relief. Two gunboats have been withdrawn from the Zambesi.

The Atlantic.

The reduction of non-effectives in commission—our *poussière navale* —should be carried further. The general position is shown in the tables prepared for Chapter III. of the *Naval Annual* of this year. None of the continental Powers deems it necessary to make an imposing display of naval force in the Atlantic.

The complements of our ships in commission in the Atlantic may be taken at from 6000 to 7000 men. The return laid by the Admiralty before the Colonial Conference gives the cost of maintenance, exclusive of building, as under :—

North America and West Indies	£330,000
Cape of Good Hope	396,000
South-East Coast of America	76,000
	£802,000

With the powerful Cruiser Squadron and the Channel Fleet ready for any service a reduction should be possible in our Atlantic squadrons.

The Pacific.

On the Pacific station the British Squadron includes one first-class, two second-class cruisers, and a sloop, manned approximately by 1400 men. No other European flag is permanently shown in those distant waters. Our Australian Squadron, reconstituted as recommended by Admiral Beaumont, should include one first-class cruiser (already on the station), and two or three modern second-class cruisers, which could be provided from the China station. The police work for the islands requires separate consideration. For political reasons it is desirable to keep up an effective squadron for Australasia. It is a link with the mother country and a reserve for the China Squadron. It will be valuable for recruiting and training the Colonial Naval Reserve. The complements on the Australian station number some 3500.

The French naval force in the Pacific consists of one second-class cruiser, complement 375, as against the combined strength of our Pacific and Australian Squadrons.

In the China Seas our complements number some 8000 men. The cost of maintaining the squadron is £1,430,000. A reduction should be possible by the gradual withdrawal of small vessels.

The Imperial naval force on the East India station should be reduced to a commodore's command. Our present force consists of seven ships manned by 1369 men. The Indian Government should be encouraged to strengthen the local Navy. The cost of maintenance of the squadron is £303,000. The imperial force should not exceed the strength which can be maintained with the contribution received from India.

The flags of the leading maritime Powers of continental Europe are rarely seen on the stations with which we have been dealing. There are no organised squadrons. The total number in the British ships aggregate some 13,000 men. Many vessels might be withdrawn without prejudice to our interests. Their crews would materially help us in the manning of the powerful battleships and cruisers now in hand.

Revision of complements.

When large reductions of crews in the winter months were lately proposed by the French Minister of Marine, it was urged by writers in Service journals as an alternative policy that the complements should be permanently retained, but with reduced numbers. The suggestion merits the serious consideration of the British Admiralty. The full numbers for ammunition parties, and for manning every gun in secondary armaments, can hardly be indispensable in peace service. Complements could be promptly raised to a war footing from the Reserves. Some revision of numbers would help us to provide crews for new ships without increasing the permanent force.

STRENGTH, RECRUITING, AND TRAINING OF *PERSONNEL*.

Training.

Passing from the expenditure on the Navy to the efficiency of the *personnel*, the important Memorandum of the First Lord of the Admiralty, dealing with the training and position of naval officers, marks a new departure in an ancient and noble service. It is dealt with at length in the *Naval Annual* for this year. The altered character of the modern Navy had long ago called for a corresponding change in the subjects and the methods of professional training. To discuss the ultimate developments in relation to the position of officers, would be premature. It is difficult to believe that engine-room duties can be interchanged with those of navigation and

command. The promotion of the engineer officers to the highest grade should be appropriately found in the dockyards and in Admiralty appointments.

Permanent force.

In ability to man our ships with permanent men we have nothing to fear from any comparison. The *personnel* of the great fleets is given in the *Taschenbuch der Kriegsflotten* for 1902:—Great Britain 122,900, France 53,000, Russia 62,000, Germany 33,500, United States 37,800, Japan 31,000. While the latest figures in Part IV. of the *Naval Annual* differ from the above, they also serve to bring out the greater reliance placed by the Continental Powers on Reserves as compared with Great Britain. In the case of Russia no inconsiderable proportion of men are recruited from the inland provinces of the empire. They pass the winter months ashore in the ice-bound island of Cronstadt. Their summer experiences are confined to the land-locked and generally unruffled waters of the Gulf of Finland. Landsmen in large numbers are found in the naval forces of France, Germany, and the United States. This policy of training men for a few years, and then passing them into the Reserve, is one deliberately adopted by all the Powers except Great Britain. It is based on a consideration of the numerous unskilled duties which have to be performed on board ship. Beyond a safe provision for the replacement of casualties, the experience of war is not different from industrial undertakings, in that it is a ruinous policy to train up skilled men for the performance of unskilled duties. The great change from war to peace is the large expansion which must take place during the transition period in the number of unskilled men whose training has made them so far seamen and stokers as to work intelligently under their officers. For this purpose a short period of service suffices.

Enough has been said to show that the present position of the permanent force of the British Navy is satisfactory. In ships, in sea officers and men, inspired by the best traditions of the past, and highly trained, we may compare, not to our disadvantage, with the combined strength of France, Russia, and Germany; and such a combination is too improbable to call for serious consideration. It is inconceivable that the foreign policy of the Empire should be so ill-directed as to bring into array against us the united naval forces of the three chief Powers of Europe.

Appropriation of expenditure.

Having dealt with the aggregate expenditure, we may pass on to examine the appropriation of the supplies which Parliament is called upon to vote. In the consideration of naval requirements, at every stage, we have first to look to the expenditure of other Powers.

Manning.

Manned as it is without recourse to conscription, the cost of the British Navy is necessarily heavier than that of the navies of Continental

Powers, in which conscription is in force. In round figures the cost per head is :—France, £70 ; Germany, £60 ; Russia, £50 ; Italy, £50 In the United States the cost per man in time of peace rises to £115. With the addition of 4600 men proposed for the British Navy in the financial year we have an increase of £632,000 in the votes.

The additions to the British Navy Estimates, under the several votes which provide for the manning of the Navy, have, in recent years, been greatly in excess of the expenditure elsewhere. The figures are as under :—

NAVY ESTIMATES, 1903-4.

		Increase.
Numbers voted	127,100	4,600
	£	£
Vote I.—Wages . . .	6,312,800 . . .	350,800
,, II.—Victualling .	2,292,500 . . .	269,000
,, III.—Medical . .	259,000 . . .	12,500
Total	8,864,300	632,300

For the year 1893–4 the corresponding figures were :—

Numbers voted	74,100
	£
Wages	3,520,000
Victualling	1,215,700
Medical	125,000
Total	4,860,700

In the last ten years we have added 53,000 to the numbers, and four millions, in round figures, to the annual cost of the permanent force. To this increase we have to add future charges upon Estimates for the retired pay of the increased numbers. The amount for non-effective services for 1903–4 is £2,320,700. The recent additions to the permanent force will double the non-effective votes. What will they say of the administrators of to-day in the parliaments of the future?

Foreign navies. We may compare the expenditure in connection with the *personnel* for the British Navy with the votes for foreign Powers.

	France.		Germany.		Russia.	
	1902.	1903.	1902.	1903.	1902.	1903.
	£	£	£	£	£	£
Pay . . .	1,952,982	1,928,405	958,948	1,026,530	603,036	} 1,209,224
Victualling .	831,852	811,591	69,676	73,396	203,398	
Clothing . .	151,848	155,014	17,346	17,509	303,758	
Medical . .	79,304	77,704	69,984	74,679	126,570	132,000
	3,015,986	2,972,714	1,110,954	1,192,114	1,236,762	1,341,224

For France, Russia, and Germany the increase is trifling when compared with that for the British Navy.

Naval experts are as little disposed as military to rely on auxiliary forces. They are inclined to be doubtful on the point of efficiency. Financial considerations are necessarily grave for the statesman. They do not weigh in equal degree with those who have no direct responsibility to the taxpayer. The reinforcement of the Reserves is urgent, and has been long neglected. The Reserve Vote, as proposed in the Estimates for 1903-4, is £297,000. For the year 1893-4 the corresponding figure was £286,900. The Reserves have been starved. We muster 41,540 men, all told. Supervision of drill and instruction by naval officers, and the equipment, drill-sheds, guns, and drill-ships have been inadequate. Naval Reserves.

The following table shows that, while we have no difficulty in obtaining men for the permanent force, the inducements are not sufficient to bring up even the inadequate number of the Reserve Force voted by Parliament:

	Number voted 1902-3.	Number actually borne on Jan. 1, 1903.
Royal Naval Reserve	27,780	26,559
Royal Fleet Reserve	10,500	9,008
Pensioners	5,078	5,978
Total Reserve	43,358	41,540
Permanent Force	122,500	122,666

France has a Reserve of 50,000 effectives. Germany has 74,000 men on the rolls. In Russia the Reserves are growing rapidly. Great Britain stands alone among the maritime Powers in manning the Navy in peace wholly with men enlisted for long service.

With due care in their training a Reserve force can be made efficient. The fleets which won the great battles of the past were not manned by permanent men. The crews were raised by the press-gang. For the most part they were not seamen. They were trained rapidly in the school of experience in war, and brilliant victories were gained. It has been contended that in the modern ship of war the complications of construction, machinery, and armaments demand higher skill and training in the crews than were necessary in the ruder types of former days. The subject was discussed at length in Lord George Hamilton's Memorandum of 1891. "Success," he wrote, "in future wars will, I believe, rest, not so much with numbers, as with the force which can make the best use of the scientific weapons at their disposal." He proceeded to enumerate the requirements of the Navy, having regard to the difficulty of supply. Executive officers, warrant officers, engine-room officers, required a complete training, and could not be obtained Efficiency of Reserves.

in any emergency. Petty officers, seamen, and stokers required a more limited training. The increase to the force of permanent men should consist mainly of the classes requiring high training. For the other classes we could rely upon the Reserves.

Practical naval opinion.

The opinion of the younger officers of the Navy is valuable on this subject. The writer of an essay, to which the second prize of the Royal United Service Institution was recently awarded, may appropriately be quoted :—

"Take" he says, "the case of a modern cruiser, the Cressy, with a complement of 615 officers and men. This ship has two 9·2-in. guns, twelve 6-in., and seventeen light Q.F. guns. Eighteen men for the 9·2-in., ninety-six for the 6-in., and sixty-three for the light guns, are necessary to form the full crews, or 177 in all. Of this total a considerable proportion of the 'higher numbers' of the guns' crews could be replaced by absolutely untrained men. Their duties do not call for special skill. Captains of guns must be good shots.

"Great skill and care are required in adjusting torpedoes, so that one fully trained man at least is required at each tube. The purely mechanical work of hoisting the torpedo up and putting it in the tube could be performed efficiently, though slowly, by untrained men under his skilled supervision. In magazines, in shell rooms, and in the passages, to pass the ammunition to the guns, employment for absolutely untrained men can easily be found in abundance. On deck we appear to be in a far better position than in the sailing days. Helmsmen and telegraph men alone are required apart from the captain and his attendants. No riggers or sail trimmers now to work the ship, their place is taken by engineers and stokers below. For purely fighting purposes a man-of-war should rapidly become efficient, if commissioned with a portion only of her crew trained in the peace methods of the Navy." Among the highly-trained men on deck, who ought to be trained up from their earliest years, the signalling staff should be included.

The United States Navy.

The present writer can contribute something on this subject from personal observation. When the fleet assembled last year at Spithead for the Coronation review, he took the opportunity of paying a visit to the American flagship. In reply to some remarks on the fine appearance of the crew, the captain said: "You will probably be surprised to learn that out of my ship's company of 700 men no less than 135 were drawn from the inland states, chiefly from Chicago and the vicinity. These men have fully compensated for their inexperience at sea by the pains they take to acquire a knowledge of their duties. In a mastless ironclad they are not those of

an A.B. The training required is in gunnery and boats." In addition to the novices the ship carried ninety-five apprentices. The complement was thoroughly efficient, although consisting, as to a full third of the total number, of untrained men.

In France, and to a larger extent in Germany and Russia, crews, as we have pointed out, include a considerable percentage of landsmen. In comparisons of strength we do not reckon foreign ships to be inefficiently manned.

Committee on Reserves.

While gradually reducing the permanent force, we should strengthen the Reserves. A well-trained Reserve force, at one-tenth the charge for an equal number of long-service men, would give perfect security to the country against danger. It is not possible to be definite in the estimate of the numbers which might be required to meet the stress of a long and hard-fought naval war. The Admiralty have recognised that their policy in relation to manning needs revision. Early in last year a strong Departmental Committee was appointed, with Sir Edward Grey as chairman. That Committee has lately presented its report. In dealing with their important recommendations some observations may be repeated, on the lines which have been consistently followed in previous numbers of the *Naval Annual*. No difficulty need be apprehended in raising our Naval Reserves to any necessary standard of strength. We have new fields of supply to compensate for the steady diminution in the number of British seamen and firemen in the over-sea trades.

Marines.

The Estimates for 1903–4 make no provision for increasing the strength of the Marines. In a mastless navy Marines may gradually take the place of a certain number of bluejackets. As gunners, the Marines, and especially the Marine Artillery, rival the bluejackets in efficiency. The Ocean stands at present the best gunnery battleship in the world. It was a Marine Artilleryman who lowered Petty Officer Grounds's score of eight hits for eight rounds in a minute with the 6-in. gun, by getting in nine hits for nine rounds in the same time, and the next best shot in the Ocean was another Marine Artilleryman.

Permanent garrisons at naval ports.

Our resources for manning the Navy might be materially increased by organising a portion of the Army as an amphibious force. Being accustomed to discipline, soldiers are certainly more suitable for embarcation than the untrained civil population. The necessary administrative arrangements should be carefully considered. Regiments might be permanently quartered at the naval ports. Exercised in boats and drilled with the Marines as naval gunners, they would be better prepared to go afloat than the regiments which did such fine service with the Fleet in the days of Lord Nelson. A

Marine Reserve of at least 15,000 men could be obtained by maintaining permanent garrisons at the naval stations of Chatham, Portsmouth, Plymouth, Pembroke, Queenstown, Malta, Gibraltar, and Halifax.

The Royal Fleet Reserve.

Turning to the seamen and stokers, short service in the Navy will supply the best men for a Reserve. The Royal Fleet Reserve, a most valuable force, has recently been organised. The Reserves Committee recommend the removal of the limit of 15,000 in the numbers.

Recruiting for Reserves.

Behind the highly-trained men supplied to the Reserve by an extension of short service in the Navy, we have many sources from which recruits may be drawn. The Reserves Committee make numerous recommendations with the view :—

(*a*) To encourage recruiting.

(*b*) To attract large classes, such as yachtsmen and others, who have hitherto held aloof.

(*c*) To increase drill accommodation and to give instruction with modern ordnance.

Stokers.

It has been shown that for gunnery and deck duties, the Reserve may be raised to any number which may be required. It is more difficult to man the engine-rooms and stokeholds. Reserves must be raised and trained in the Navy by a system of short service. The Reserve Committee recommend that ships should embark as supernumerary to the complement as many more non-continuous service stokers as could be accommodated. The non-continuous men should engage for five years' service in the Fleet, followed by service in the Royal Fleet Reserve, to make up twelve years from the date of entry. In addition to the new sources of supply created by short service in the Navy, the Reserves Committee suggest the entry of stokers from gasworks, electric light factories, and other works. If the terms be made attractive large numbers could be obtained. We have a source of supply, from which no attempt has yet been made to draw recruits, in the many thousands of firemen of the tropical races employed in British ships. Our Indian troops are reliable for the military service. From the same races we should raise a Reserve for the Navy, and more particularly for the engine-room complements. Mr. Anderson, the well-known shipowner, gave evidence in this sense before the Reserves Committee. The Reserves Committee specially insist on the pressing need for Reserve stokers. It is thought that a large number could be obtained in Malta, who, being all collected in a small area, would be readily available within a few days of England.

Royal Naval Artillery Volunteers.

Having taken an active part in raising the Royal Naval Artillery Volunteer force, and having cruised with the volunteers afloat, it is a source of satisfaction, deeply felt, to know that the revival of the

force is favourably entertained by the present Board of Admiralty and recommended by the Reserves Committee. The men formerly enrolled were full of loyal spirit. They were too hastily disbanded. The Reserves Committee quite properly insist that the volunteers should engage to serve anywhere and do any duty for which they are found competent. They should be under the Naval Discipline Act. The Committee consider that sea-training should, as far as possible, be given in sea-going ships of the Navy and that it is desirable to encourage the movement to establish Royal Marine Volunteers, trained and organised on a system assimilated to that of the Royal Marine Force.

Colonial Naval Reserves.

The subject of Colonial Naval Reserves is dealt with at some length by the Committee. They rightly observe that experience in South Africa has shown how strong is the desire of the colonials to assist in the defence of the Empire, and how valuable is the aid which they can give. To make a Colonial Naval Reserve force efficient, training may be given in batteries on shore and in vessels turned over from the Imperial service to the Colonial Governments, to be used as training-ships. The Committee suggest that facilities should be afforded for a more thorough training in His Majesty's ships on foreign stations. This is being done in Newfoundland. Thirty years have elapsed since, at the close of a cruise in Canadian waters, the writer took up the question of a Colonial Naval Reserve. During his residence in Australia, in an official capacity, the subject was frequently under discussion. As the result of an inquiry by the Naval Commandants, it was shown that the seafaring men were more numerous than might have been expected. From Newfoundland and Nova Scotia an important reinforcement to our reserve of seamen may be obtained. Recommendations consistently urged in the pages of the *Naval Annual*, and which have long remained neglected, have at last borne fruit. The initiative was taken by Lord Goschen. Further action has been taken by Lord Selborne. To-day we have the complete and practical recommendations of the Reserves Committee.

Naval Reserve officers.

The numerous recommendations of the Reserves Committee with reference to the officers of the Naval Reserve are of the utmost importance as conducive to efficiency. They are less important in relation to the financial aspects. Their recommendations include an increase in numbers, the establishment of the rank of commander for senior men in important commands, and the weeding out of those who are considered unsuitable for the naval service. Every appointment to the commissioned ranks of the Naval Reserve should be probationary, until the officers have served twelve months in the

Navy, and have been favourably reported on by the captains under whom they have served as fit to hold a commission in the Reserve.

The Admiralty should do more for the training of the Naval Reserve. No steps have been taken to insure that the cadets, whose names fill pages of the Navy List, are being educated fittingly as officers of the Royal Navy. On leaving the harbour training-ships, the Conway and the Worcester, it is difficult to continue the course of education so well begun in the early stages. I once more strongly urge that the Admiralty should grant premiums to ship-owners who are prepared to provide proper facilities for the sea-training and education of the cadets of the Royal Naval Reserve. The early training of officers is of great importance. The plan of training which was carried out with eminently successful results in the Hesperus and Harbinger is now being worked by Messrs. Devitt & Moore in the Illawarra and Macquarie, sailing vessels of 1900 tons register, in the Australian trade, each carrying 40 midshipmen. Some details have recently been published by Lieut. Gordon, R.N., the instructor serving in one of these vessels. The newly-joined midshipmen are taught all details of seamanship. Education, chiefly in mathematical subjects, is conducted with as much regularity as conditions of weather permit. With assistance from the State, the education might, with advantage, be extended. Such aid should be given only for those cadets who have been entered for the Royal Naval Reserve. A Naval Reserve of officers whom the Admiralty has taken no pains to prepare for their duties by education is a paper reserve.

General conclusions.

Let it not be deemed that in these observations undue importance has been given to the subject of Naval Reserves. The numbers of the permanent force for the manning of the Navy have in ten years been increased, by steady annual increments, by no less than 50,000 men. This involves an additional annual charge of over £4,000,000. If the present policy is maintained, our permanent force will grow to such numbers as may involve the imposition of intolerable burdens. We have passed the limits of taxation which can be borne in time of peace. We are crippling the recuperative powers of the country, and thus weakening the ability to bear any sudden pressure upon our resources. If we appropriate in undue proportions to manning progress in construction must be delayed. That is not a result which the naval advisers of the country would contemplate with satisfaction.

Having provided a sufficient number—I will venture to put it at

100,000—of the highly-trained men of the permanent force, the true policy is to look to the Reserves.

> "This thing's to do
> Sith I have cause, and will, and means
> To do't."

Availing ourselves of the many resources we possess, we may bring the Reserves to a full standard of strength. We may have as many Reservists as permanent men. The withdrawal of vessels only useful for peace service from foreign stations where no other European flag is seen is the first step to be taken in order to prevent a further increase of the permanent force. I will venture to hope that the policy will be approved, nay, insisted upon, by Parliament. It is not open to doubt that by the different methods we have dealt with, a Reserve of 100,000 men can be formed. Such a force should be sufficient for any emergency. When constituted, we may reduce the permanent men to an equal number.

Repairs and Boilers.

Repairs.

The management of industrial establishments under Government must always be conducted at some disadvantage. The supreme control is in the hands of administrators responsible to Parliament, selected, not for their technical knowledge, but for their political influence and ability. Under Treasury regulations rewards are not offered for special exertions. A serious cause of wastage of money will be removed by the decision recently taken by the Admiralty that the vessels put out to contract shall be delivered to the dockyards "complete in all respects." In dealing with heavy repairs the present Admiralty have taken a new departure by putting out ships to contract. With the vast addition to the force in commission, increased demands have come upon the dockyards for repairs and refits; and there are limits to the power of effective supervision by the professional staff. If too much is attempted the result must be congestion and delay. An effective remedy has been applied by putting repairs out to contract, under a schedule of prices. It is due to the Controller of the Navy, Admiral May, to say that many reforms have been accomplished under his admirable administration. Never have the important duties of the Controller been more ably discharged.

Water-tube boilers.

The introduction of Belleville boilers has been the cause of wasteful expenditure. Water-tube boilers were recommended to the Admiralty by their professional advisers, on the ground that weight would be saved, repairs more easily effected, and steam raised more

quickly than in cylindrical boilers. Boilers of the water-tube type had been adopted in the French Navy. The advantages of the new system were conspicuous on first trial from the point of view of tactical efficiency. In a short time orders had been given by the Admiralty for Belleville boilers of more than a million H.P. The new type was accepted without carrying the preliminary trials far enough, and before the officers and stokers of the mechanical branch had been sufficiently trained. When the boilers came into use, they were successfully worked in many ships; they were partial failures in other ships; and some broke down altogether.

Advice of civil experts.

It was a wise decision on the part of the Admiralty to secure for the Navy the advantage of the best scientific and practical advice obtainable. A competent Committee was appointed. As the result of their inquiries and experiments, it has been decided to continue in His Majesty's ships four-fifths water-tube and one-fifth cylindrical boilers. Reviewing past experience, Lord Selborne, in his Memorandum on the Estimates, writes as follows:—"I have never attempted to minimise the difficulties which have been caused to the Fleet by the adoption of Belleville boilers. These difficulties were due partly to the faulty manufacture of the first series of such boilers, partly to the great increase of pressure, and partly to the initial want of training of the *personnel* in their management; but they were mainly *ejusdem generis* with those which the Navy had for years to contend with on the first adoption of the various kinds of boilers which preceded them." The frequent failures in the machinery and boilers of His Majesty's ships are probably due to the pressure put by the naval architect on the engine-builder to cut down weights. Weight saved in machinery means increased thickness of armour, a larger area protected, and more powerful armaments.

Boilers in foreign navies.

It is interesting to take note of the experiences in foreign countries. In the German Navy it has been decided that half the boilers fitted in new ships shall be of the cylindrical pattern, for use in the ordinary conditions of service. Water-tube boilers are to be used in action, or when a sudden increase of speed is necessary. In the United States the chief engineer of the Navy has strongly recommended water-tube boilers; the battle of Santiago had shown the necessity for their use. The Babcock and Wilcox is the type of boiler recommended. France, as already said, was before us in the adoption of water-tube boilers, yet the trials of new ships are still marked by many failures.

The Committee on Boilers should become a permanent institution. In these days of extreme speed and vast dimensions the designs for propelling machinery are so complicated, the cost is so great, and the

efficiency of the Navy depends so closely upon the attainment of the highest possible perfection, that it seems hardly prudent to throw the whole responsibility on the Engineer-in-Chief.

Naval Works.

The appropriations to naval works, though not provided directly from the Navy Estimates, are a charge on the taxpayer incurred for the reinforcement of the Navy. The expenditure on naval works should be considered in connection with the Estimates. An examination of the Navy Estimates of the chief maritime Powers of Europe will show that our expenditure on naval works has been carried to excess.

Naval Expenditure, 1902–3.

	Total.	Ship-building.	Naval Works.	
	£	£		£
Great Britain, Estimates . .	31,255,000	9,473,000	Vote 10 & Navy Works Acts . .	3,349,000
Navy Works Acts	2,749,015			
	34,004,015			
France	12,271,000	4,407,000		598,423
Germany	10,234,000	3,679,000		366,212
Russia	10,600,000	2,600,000		961,118
	33,105,000	10,686,000		1,925,753

Note.—The expenditure under Navy Works Acts is taken at the amount given in the Parliamentary return for the year ending March 31, 1902. In Russia special expenditure on ship-building has been proposed. The naval works of foreign Powers include items which in Great Britain would be included in Military Works Bills.

While keeping pace, but not more than keeping pace, with the three Powers in ship-building, our expenditure on naval works in the period 1895 to 1901, as authorised under the Naval Works Bills, increased from £8,806,000 to £27,502,000. In addition, large sums were voted under Military Works Bills for the defence of naval stations at Gibraltar, Halifax, Malta, Wei-hai-Wei, Bermuda, Jamaica, and other places. When public opinion demands reinforcements for the Navy there is a tendency favourably to consider proposals for extending dockyards and constructing breakwaters. The structures reared by the civil engineer are commended to approval as being, in the nature of things, more enduring than the creations of the naval architect. They do not always add materially to the sea power of the Navy.

Colonial Contributions.

In estimating our financial resources we cannot look to the self-governing colonies. To rely on contributions, sufficient in amount to Federation.

give any real help, is to lean on a broken reed. A scheme of representation, the necessary corollary of contributions, has yet to be devised. The recent conference with the Premiers of the self-governing colonies met under favourable auspices. In South Africa our arms had been crowned with victory. Colonial contingents had stood shoulder to shoulder with Imperial forces. The Coronation had brought together representatives of every part of the Empire. It was an impressive object lesson. It taught that unity is strength. The Minister who presided has commanding influence in the Colonies. He is in full sympathy with the Imperial ideal. Mr. Chamberlain wisely recognised that it was premature to press schemes of federation for acceptance by the Conference. No decisions were taken, except in relation to defence. The subject was raised in a resolution, moved by Mr. Seddon, and in a Memorandum prepared by Sir John Forrest, Minister of Defence under the Australian Commonwealth, in consultation with Sir Lewis Beaumont, Commander-in-Chief on the Australian Station. Sir John Forrest was opposed to the establishment of an Australian Navy, both on grounds of expense and because it was not possible to attain to a high standard of efficiency in a small service. He was prepared to make a larger contribution to the cost of the Imperial squadron on the Australian station. The views put forward by Sir John Forrest have not been favourably criticised by the Australian Press. Canada was also dissentient, on the ground that the proposals would entail an important departure from the principle of Colonial self-government.

Local Navies.

Ambitious schemes for an Australian Navy are in the air. They can only be realised by an expenditure quite beyond the resources which at present, or for a long time to come, can be available. If in some later day a local Navy should be created, the naval forces of the Commonwealth would give the same ready and powerful help at sea as we have lately received from the contingents in South Africa. Assisted in the protection of our Colonies by a Colonial Fleet, and of our Indian possessions by an Indian Fleet, the naval power of Great Britain would be greatly strengthened. Let us not be too hasty to criticise Australian statesmen when they insist that their coasts shall never be left wholly unprotected by the Navy. For ourselves it is held as an axiom that we must never lose the command of the Channel. In the United States, when at war with Spain, a portion of the Fleet was retained for coast defence, Captain Mahan being a member of the council of defence by which the movements were directed.

Indirect aid.

While their subsidies are inconsiderable, the Colonies are contributors on a vast scale to the wealth of the mother country. Some

telling statistics have been put together by Mr. Parkin. He estimates the borrowings of Australia at £400,000,000, all of which was raised in London, and not on the easiest terms. Canada's public borrowings exceed £50,000,000. An equal sum may be allowed for private loans. British capital to the amount of nearly 400 millions has found a profitable field in India. The aggregate of money loaned from Britain, and borrowed by other parts of the Empire, reaches enormous figures—it has been computed as exceeding 1000 millions sterling. For investors and borrowers the benefit is mutual. In proportion to population the Colonies have been the best customers for our manufactures. We have received in payment raw materials and supplies of food in increasing volume and at falling prices. Our share in this exchange is not disadvantageous. Meanwhile, let us gratefully accept from the Colonies such aid as they are able to give, and in the form in which it is most readily given. A generation ago the self-governing Colonies began by relieving the mother country of the heavy charge formerly incurred in providing for the defence of important naval positions at the sole cost of the Imperial Exchequer. Our principal naval base at Sydney and the ports of Fremantle, Adelaide, and King George's Sound have been strongly fortified. Effective steps, as we have seen, are being taken in Newfoundland, in Australia, and New Zealand to raise a strong reserve force for the manning of the Navy. The importance of Reserves may seem small in peace. It would be quite different in war with powerful foes. The wastage would be great. Every available man would be needed.

Imperial and National defence.

If the Conference has not done much to help us, we may in fairness keep in view that the naval expenditure especially incurred for the protection of the Colonies is trifling in amount. When Navy Estimates are in preparation we do not look to the Colonies. We consider the expenditure of other Powers, which we must be prepared to meet. Our programme of ship-building is based on such comparisons. The subject of Colonial contributions for the Navy was discussed by Earl Grey in his volumes on the Colonial policy of the administration of Lord John Russell. His words may be quoted: "The naval expenditure which is frequently charged against the Colonies cannot in my opinion be so with any justice, since, if we had no Colonies, I believe the demands upon our naval force would be rather increased than diminished, from the necessity of protecting our commerce." The views of Earl Grey were shared by Sir Cornwall Lewis. In his essay on the "Government of Dependencies" he wrote as follows: "It is not easy to estimate how far Great Britain could afford to diminish the strength of her Navy, even if she had no foreign

or Colonial possessions. To make the British Islands secure against foreign invasion; to protect British trade in all parts of the world; in a word, to keep Great Britain going as a nation, it would always be necessary to have a powerful Navy; and it is, therefore, hardly fair to state as roundly as is usually stated, that the cost of the Imperial Navy is due to the fact that the Colonies of Great Britain are so many and so widely spread."

Moral support of the Colonies

Nor let us lightly value the moral support which the Colonies have it in their power to give to their mother country. At the close of a visit to Australia, in her well-spent twentieth year, the Marchioness of Stafford, as she then was, when rounding Cape Lewin, wrote as follows: "Great Britain is, indeed, fortunate in having such brothers and sisters as she had found in Australia, loyal and true, ready to stand by her in storm and sunshine, and to see her great name sustained for centuries to come." In the war in South Africa we were grateful to the Colonies for the gallant services of their contingents. We valued even more the support which the public opinion of the Colonies had given to British policy. The contingents had drawn no conscript sword. Colonial statesmen had given their testimony in the name of free peoples. The Colonies have helped the mother country, and will yet help her, but not by subsidies. They will come to us as companions in arms.

BRASSEY.

PART I.

CHAPTER I.

Progress of British Navy.

The most important event in the history of the British Navy during the year under review is the production of the new scheme of entry which was published on Christmas Day, 1902. This scheme is dealt with fully in Lord Selborne's Memorandum and in later chapters. Briefly, it makes the avenue of entry for the Executive, Engineering, and Marine Officers the same. At the age of twelve to thirteen, all cadets enter the training college at Osborne for a four years course, and then go afloat for a period of two and two-third years to three years in sea-going ships as midshipmen. They then pass through their sub-lieutenant courses, similar to those now existing with the addition of engineering as a special subject. It is not until the completion of the sub-lieutenant course, lasting about a year, that specialisation is resorted to for the three branches. New scheme of entry.

The new scheme of entry is a great attempt to solve a very difficult question. One of the points in the scheme most open to criticism is the reduction of the age of entry by two and a half years as compared with Lord Goschen's scheme. The cost to the State of each naval officer will be necessarily increased by this reduction. It is difficult to understand what advantage is gained by placing the age of entry so low. The cost and the wastage would be considerably diminished were the age of entry fixed at that at which boys ordinarily go to public schools. The consequences of the amalgamation of the executive and engineer branches in the United States Navy are described by Admiral Melville in his report.* These are to some extent avoided under the scheme of the British Admiralty, owing to the specialisation of the three branches after the age of twenty. Great stress is laid by Lord Selborne on the value of some knowledge of engineering for the executive officer. The main object to be aimed at in the training of executive officers is to produce a Criticism upon.

* The defects which Admiral Melville draws attention to might have been partly obviated had a sufficient number of officers been provided to meet the growing demands of the Fleet.

captain who is capable of handling his ship and an admiral who is capable of manœuvring a fleet. For this purpose nerve, quickness of eye, and readiness of resource are the qualities most required. While it is undoubtedly desirable that the executive officer should possess sufficient knowledge of engineering to enable him effectively to command his ship, it is certain that an officer who has specialised as an engineer will not be fitted either by training or experience to handle a vessel or a fleet. There is no real analogy between the engineer officer afloat and the engineer officer in the Army. The scheme therefore is good in that it makes a knowledge of engineering compulsory for the executive officer; but it is very doubtful whether the placing of the engineer on the same footing as the executive officer is in the best interests of the service. The class from which the present naval engineers are drawn has furnished an excellent body of public servants; under the new scheme this class will be practically excluded from the Royal Navy. The legitimate grievances of the existing engineers would have been met by improving their prospects of promotion. The social difficulty of their position exists mainly in the imagination of newspaper writers, and we doubt whether the existing naval engineers desire to be placed on an equality in all respects with the executive officer. While approving of the absorption into the executive branch of the marine officer, who performs similar duties afloat to the executive officer, and who is insufficiently utilised under the present system, we do not believe that the proposed treatment of the engineer who performs very dissimilar duties is either necessary or desirable. The new scheme of entry is like the Belleville boiler experiment—a leap in the dark, which may have disastrous consequences. It is to be hoped that it will fulfil the expectations of its authors.

Battle-ships completed

During the year 1902–3, the following vessels have been completed, viz., four battleships, five armoured cruisers, two sloops, four destroyers, three torpedo boats, and six submarines.

The two remaining ships of the Formidable class have been completed. The London is in commission as flagship in the Mediterranean. The Venerable, which has also joined the Mediterranean Fleet, was laid down at Chatham on January 2, 1899. Her engines are by Messrs. Maudslay and Co. On the thirty hours' coal consumption trial at one-fifth power, the speed was 11·45 knots with 3082 I.H.P., and a coal consumption of 2·01 lbs. On the trial at four-fifths power, the speed by log was 16·8 knots, the I.H.P. 11,364, and the coal consumption 1·95 lbs. On the eight hours' full-power trial a speed of 18·3 knots was attained with 15,345 I.H.P., and a coal consumption of 2·14 lbs. The speed and coal consumption

on the full-power trial thus exceeded those of her sister ships—particulars of whose trials are given in the *Naval Annual* of last year.

The Duncan class includes six ships of 14,000 tons displacement, with an estimated speed of 19 knots. The Montagu and the Russell (which was commissioned on February 24, 1903, to relieve the Canopus on the Mediterranean station) have been completed. The Montagu had considerable trouble on her trials: in the first instance with heated bearings, and subsequently with her boilers. The Exmouth steamed 19·01 knots on the measured mile, while during the full-power trial the Duncan made five runs on the measured mile, the mean speed attained being 19·11 knots. The Albemarle made her trials at four-fifths power in heavy weather. The speed was consequently less than anticipated. The following are the particulars of the trials:— Duncan class.

	Makers of Machinery.	At One-Fifth Power.			At Four-Fifths Power.			Full Power.		
		Speed.	I.H.P.	Coal.	Speed.	I.H.P.	Coal.	Speed.	I.H.P.	Coal.
		knots.		lbs.	knots.		lbs.	knots.		lbs.
Albemarle .	Thames Ironworks	12·05	3606	2·26	17·2	13,587	2·12	18·6	18,296	1·96
Cornwallis .	Thames Ironworks	10·9	3724	1·95	17·7	13,693	2·09	18·9	18,238	1·89
Duncan . .	Thames Ironworks	11·9	3755	2·05	18·1	13,717	1·9	18·9	18,232	1·95
Exmouth .	Laird Bros. . .	12·4	3667	2·18	18	13,774	1·95	19·05	18,346	2·13
Montagu .	Laird Bros. . .	12	3676	2·21	17·8	13,652	1·78	18·8*	18,285	2·11
Russell .	Palmer	12·1	3768	2·4	17·95	13,696	2·14	19·3	18,229	2·09

* The speeds given in the above table are by log.

Eleven battleships will be under construction in April, 1903. The Queen, completing at Devonport, and the Prince of Wales, building at Chatham, are of 15,000 tons displacement. The machinery and boilers of the former are by Messrs. Harland & Wolff, of the latter by The Greenock Foundry Company. Battleships building.

Five battleships of the Edward VII class are under construction. The first keel plate of the Edward VII was laid by H.M. the King at Devonport, on March 8, 1902. She is expected to be ready for sea by September, 1904. The Commonwealth is building at Fairfield, the Dominion at Messrs. Vickers, Maxim & Co.'s works at Barrow, the Hindustan by Messrs. J. Brown & Co. at Clydebank, and the New Zealand at Portsmouth. Some description of the Edward VII class was given in the *Naval Annual* of 1902. The displacement is 16,350 tons, and speed 18·5 knots under natural draught. The chief innovations in these ships are the four 9·2-in. guns mounted in casemates on the upper deck, in the position occupied by 6-in. guns in the Formidable and Majestic classes, and the adoption of continuous side armour, in place of casemates, for the protection of the ten 6-in. guns on the main deck. Edward VII class.

The cost of the Edward VII class will be (including guns) between £1,400,000 and £1,500,000—nearly half a million more than that of the Majestic class, and about twice the cost of the Renown. This is an immense sum to put into a single ship.

Protected cruisers. Spartiate.

The Spartiate, which was set down in the First Lord's Memorandum of 1902 as to be completed by March 31, did not complete her trials till July. She was laid down at Pembroke in May, 1897, and has consequently been more than five years under construction. Her engines are by Messrs. Maudslay, Sons & Field. Her trials have occupied more than two years. Owing to sand finding its way into the condensers, and the friction set up in the working parts of the machinery, the engines had to be practically reconstructed. Then trouble was experienced from excessive water in the condensers. On the thirty hours' trial, at four-fifths power, she attained a speed of 19·8 knots with 14,060 I.H.P., and a coal consumption of 1·66 lbs. On the eight hours' full-power trial, the speed by log was 21 knots, the I.H.P. 18,658, and the coal consumption 1·65 lbs.

Armoured cruisers. Cressy class.

Particulars of the trials of the Cressy class were given last year. The Bacchante has been completed. The Euryalus, built at Barrow, has been most unfortunate. After being damaged by fire while lying alongside the yard at Barrow, she slipped off the blocks while in the dock at Messrs. Laird's. The damage done to the ship on this occasion was very great. The boilers had to be removed, and much of the bottom plating and many of the frames had to be renewed. She was delivered at Plymouth in November, only six months behind the stipulated time. On January 20 and 21 the Euryalus made her trials at one-fifth power, attaining a speed of 14½ knots with a coal consumption of 2 lbs. The trial at four-fifths power on January 27 had to be abandoned on account of trouble in the condensers. In connection with later deliveries it is interesting to note that the Admiralty have intimated to the private firms that in the cases of the new first-class cruisers, the penalty for late delivery is fixed at £40 per day, and £20 per day for any excess time over the ten weeks allowed for running trials. The intention is that the penalties should be stringently enforced.

Drake class.

The Drake, built at Pembroke, the Good Hope, built at Fairfield, the King Alfred, built at Barrow, and the Leviathan, built at Clydebank, have passed through their trials. Both the Drake and Good Hope have been commissioned. The latter conveyed Mr. Chamberlain to South Africa. A description of the trials of the Good Hope was given last year, but they are here included for purposes of comparison.

The trials of these cruisers have been eminently satisfactory. They have attained the desired speed of 23 knots with comparative

	At One-Fifth Power.			At Four-Fifths Power.			At Full Power.		
	Speed.	I.H.P.	Coal.	Speed.	I.H.P.	Coal.	Speed.	I.H.P.	Coal.
	knots.		lbs.	knots.		lbs.	knots.		lbs.
Drake	15·43	6937	1·72	22·08	23,103	1·78	23·05	30,557	1·83
Good Hope . . .	15·91	7953	1·87	22·1	22,467	1·83	23·05	31,088	1·92
King Alfred . . .	15·16	6743	1·76	21·98	22,540	1·82	23·46	31,156	1·81
Leviathan . . .	15·24	6481	1·76	21·96	22,900	1·75	23·25	31,592	1·94

ease. The King Alfred exceeded it by nearly half a knot. A change in the propellers of the Drake resulted in a 24-knots speed, or one knot above the contract. The Drake class carry 2500 tons of coal, they are protected by 6-in. armour, 11 ft. 6 in. in depth for four-fifths of their length, and they have a powerful armament of two 9·2-in. and sixteen 6-in. Q.F. guns. Owing to their fine ends and the weight of the conning tower and forward 9·2-in. gun, mounted right in the eyes of the ship, these vessels tend to dive into a head sea. The forward main deck 6-in. guns could not be fought in a seaway. Unlike the midship 6-in. guns they cannot be stowed in board, a defect which could be easily remedied. The two bow main deck 12-pdrs. could with advantage be removed. *Le Yacht* criticises the absence of side armour in the after part of these cruisers, and mainly on that account prefers the United States cruiser California. Every design is open to criticism. The Drake class are certainly a powerful addition to the fighting Navy, and compare favourably with vessels of similar class building for foreign powers.

The County class includes ten ships of 9800 tons, and six of 10,700 tons displacement. The estimated speed of the former is 23 knots with 22,000 I.H.P. They have so far failed to attain their contract speed, although the designed horse-power has been exceeded. The failure

County class. Trials of.

	Makers of Machinery.	Boilers.	At One-Fifth Power.			At Four-Fifths Power.			At Full Power.		
			Speed.	I.H.P.	Coal.	Speed.	I.H.P.	Coal.	Speed.	I.H.P.	Coal.
Bedford .	Fairfield .	...	14·92	4522	1·91	21·2	16,005	1·97	22·7	22,457	2·12
Essex . .	J.Brown&Co.	...		4633	2·03	19·97	16,132	2·17	*		
Kent . .	Hawthorn, Leslie & Co.	...	14·6	4632	1·81	20·45	16,209	1·83	21·7	22,249	1·89
Monmouth	London and Glasgow Co.	...	15·6	4710	1·82	20·49	16,319	2·15	*	...	...

* The full-power trials had not been run at date of going to press.

has been attributed to the unsuitability of the propellers. The change made in the propellers of the Kent has not had the desired effect, though better results may still be attained. The maximum

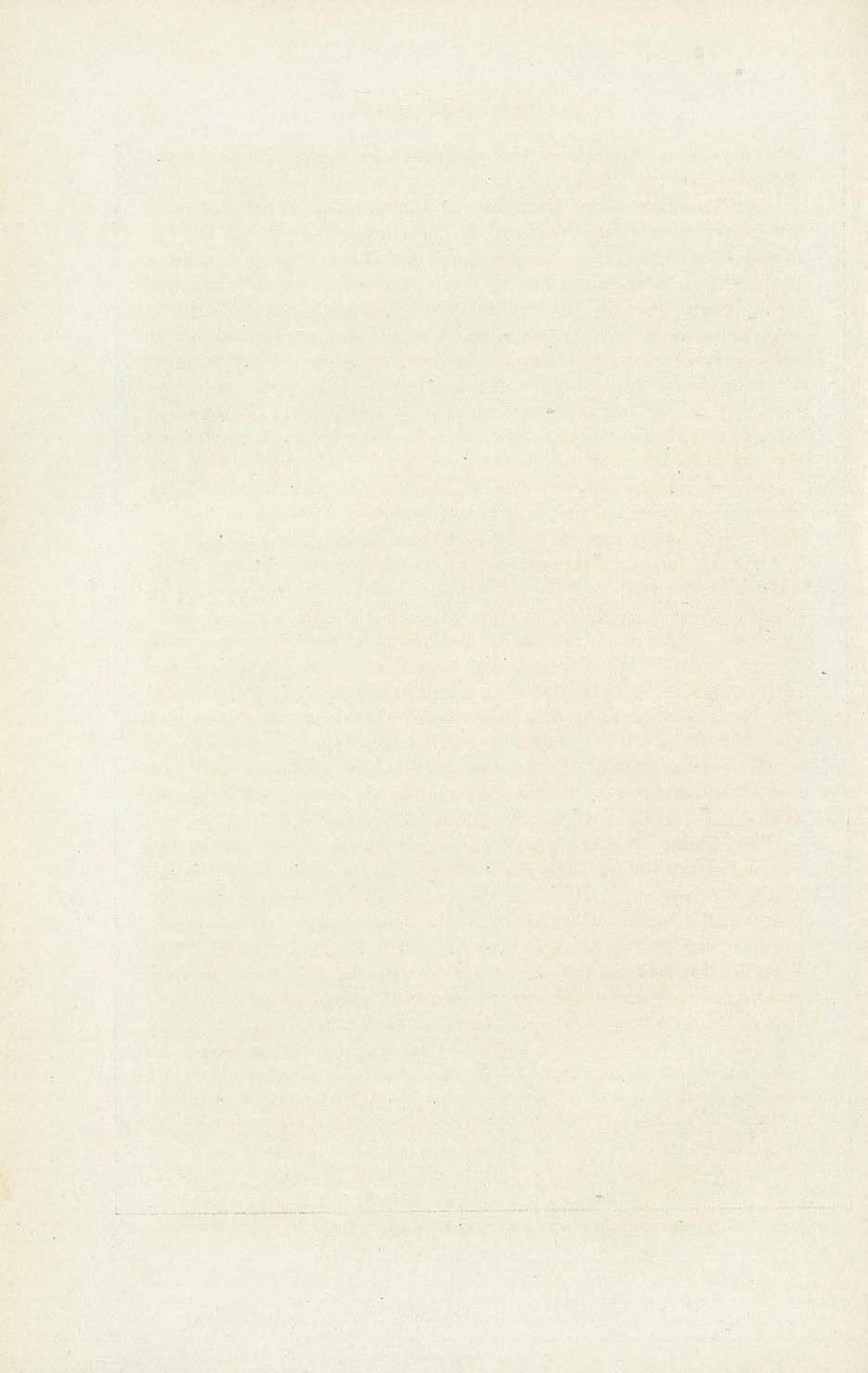
speed attained on the trials in January was only 21·89 knots, or very slightly greater than that on her trials, of which the results are given on previous page. At the trial at one-fifth power considerable trouble was experienced with leaky condensers. The Essex left Pembroke on January 14 for Portsmouth. Her trials, as well as those of the Monmouth, are in progress.

Launches of.

The Cornwall was launched at Pembroke on October 29, 1902. Her engines have been manufactured by Messrs. Hawthorn, Leslie & Co. She is fitted with twenty-four Babcock & Wilcox boilers. The Cumberland was launched from the London and Glasgow Shipbuilding Company's yard at Govan on December 16. Her machinery is supplied by the builders. The Donegal was launched in an advanced state at the Fairfield yard on September 4. Both the Donegal and Cumberland are fitted with thirty-one Belleville boilers. The Donegal's engines are manufactured by the builders, and her armour by Cammell & Co. The Berwick was launched from Messrs. W. Beardmore & Co.'s yard, Govan, on September 20. The Suffolk was launched on January 14 at Portsmouth.

These ships were described in the *Naval Annual* for 1901. The following particulars are taken from the *Times:* "Vertical side armour, varying from 4 in. in the thickest part to 2 in. thick at the bow, extends for about three parts of the ship's length between the lower and the main decks, when it terminates in an athwartship bulkhead plated with armour 3 in. thick across the ship, and with the side armour forms what might be termed a citadel, and encloses most of the vital parts of the ship. Abaft the armour bulkhead, the lower deck is constructed of two plates, each 1 in. in thickness. The main deck from the same point is formed of one thickness of ⅜-in. plate only. The upper and forecastle decks are plated with steel and will be covered with wood. On the forecastle deck, 50 ft. or 60 ft. from the bow, and on the upper deck, aft, shallow circular barbettes, formed of armour 4 in. thick have been constructed to carry the principal guns. The ship will be propelled by two independent sets of vertical triple-expansion engines, each of 11,000 H.P., and each having four cylinders. The vessel will be armed with fourteen 6-in. guns, four mounted by pairs under shields in the barbettes and ten singly in the ten casemates, eight 12-pdr. and three 3-pdr. Q.F. guns, eight Maxims, and two boat and field guns. Two submerged torpedo tubes are to be fitted, and the ship will carry seven 18-in. Whitehead torpedoes and five 14-in. torpedoes for use in the boats. The crew will number 678 officers and men." The weakness of these ships is in their waterline protection. This might have been improved, as pointed out in

H.M.S. "MONMOUTH."



the chapter on Armour in Part III., by a saving of weight in the flat armoured main deck.

The Devonshire was laid down at Chatham on March 25, 1902, but delays have arisen owing to changes in her design, and the fire in the mould-loft. Her dimensions are as follows:—Length, 450 ft.; beam, 68½ ft.; draught aft, 25 ft. 3 in. She is thus 10 ft. longer and 2½ ft. broader than the Monmouth class. The displacement is 10,700 tons, the increased displacement being mainly due to the substitution of 6-in. for 4-in. armour on the side and gun positions. The armament comprises two 7·5-in. Q.F. (officially termed B.L.) guns of a new pattern, mounted in barbettes forward and aft in place of the four 6-in. guns of the Monmouth class, and ten 6-in. guns in casemates, four on the upper deck and six on the main deck. The barbettes and casemates are protected by 6-in. armour, and the side by a belt 10 ft. 6 in. in depth, and from 6 in. to 4½ in. in thickness, tapering to 2 in. on the bows. The estimated speed is reduced to 22¼ knots with 21,000 I.H.P. All these cruisers will have one-fifth of their boilers of the cylindrical type. Devonshire class.

The Argyle, building at the yard of the Greenock Foundry Company, will have four-fifths Babcock and Wilcox type. The Antrim, building by Messrs. John Brown & Co., at Clydebank, and the Hampshire, building at Elswick, will have four-fifths Yarrow type. The Carnarvon, building at Messrs. Beardmore's yard at Govan, will have four-fifths of their boilers of the Niclausse type. The Roxburgh, building at the yard of the London and Glasgow Company, will have four-fifths Dürr type. The Devonshire has six cylindrical boilers for 4500 I.H.P., and twenty-two Niclausse boilers for 16,500 I.H.P.

The Duke of Edinburgh was laid down at Pembroke on February 11, 1903, and the Black Prince has been commenced at the Thames Ironworks. They are the first cruisers designed since Mr. Philip Watts became Director of Naval Construction. Their dimensions are as follows:—Length, 480 ft.; beam, 73½ ft.; draught, 27 ft. Their leading features may be compared with those of other cruisers, building or just completed, for our own and foreign navies: Duke of Edinburgh.

	Displacement.	I.H.P.	Gun Position.	Speed.	Armament.
	Tons.			Knots.	
Duke of Edinburgh	13,520	24,000	6 in.	22⅓	6 9·2-in., 10 6-in.
Drake	14,100	30,000	6 in.	23	2 9·2-in., 16 6-in.
Victor Hugo (F. 2)	12,351	27,500	5 in.	22	4 7·6-in., 16 6-in.
California (U.S.)	13,680	23,000	6–5 in.	22	4 8-in., 14 6-in.
Francesco Ferrucio (It.)	7,294	13,500	6 in.	20	1 10-in., 2 8-in., 14 6-in.
Prinz Adalbert (Ger.)	8,905	16,000	4 in.	22	4 8·2-in., 10 6-in.

NOTE.—The maximum thickness of belt armour is 6-in. in all the above cruisers.

The chief innovations in the design of the Duke of Edinburgh, as compared with the Drake, are the substitution of four 9·2-in. for six 6-in. guns, and the adoption of a central citadel for the protection of the secondary armament. A decrease in the estimated speed of two-thirds of a knot has had to be accepted in order to provide for the additional protection. The Duke of Edinburgh, in fact, more closely approaches the battleship type than any vessel hitherto called a cruiser. The following description of the distribution of armour and armament of the Duke of Edinburgh class is taken from *Engineering:*

In the new British cruisers, the citadel will extend for about three-fifths of the length of the vessel, and the side plating will be of 6-in. cemented armour from about five feet below the water-line right up to *the main deck*. On the water-line, however, there will be, forward and abaft the citadel to the bow and the stern, armour-plating tapering from 4 in. to 3 in. in thickness, the usual armoured bulkheads forming the bow and stern athwartship walls of the citadel. The armoured deck will, as hitherto, be curved to the bottom of the side plating, thus increasing the effective protection on the broadside against gun attack. At each corner of the citadel thus formed there will be mounted a 9·2-in. (27-ton) gun, and, in addition, there will be mounted a gun of the same calibre forward of the citadel and another abaft the citadel. These two will have gun houses of 6-in. armour protecting the gun-mountings and other mechanism, with an armoured floor and an armoured ammunition tube. There will thus be afforded the maximum of protection to the isolated guns. The arrangement of the six guns will enable three 9·2-in. guns to fire ahead, and three to fire astern, without interfering with each other's sighting. In addition to these six large guns, there will be mounted ten quick-firers of 6-in. calibre, five on each broadside upon the main deck, between the 9·2-in. guns at the ends of the citadel. It will thus be noted that all of these heavy pieces are on one deck, so that there is no necessity even for casemates on the upper deck, which is also an important departure from the placement of guns in recent ships. All of the guns within the citadel will be separated from each other by traversers, with splinter screens behind, so as to localise the effect of shells which may penetrate the 6-in. armour and explode within the citadel.

Perhaps the best way to indicate the relative power of this new cruiser, as compared with her predecessors, is to record the weight of shot which may be fired in a minute, accepting for all guns the same standard. For the 9·2-in. gun we have assumed a rate of fire of four rounds per minute, and a muzzle energy of 18,400 foot-tons; for the 7·5-in., five rounds per minute, with an energy of 10,120 foot-tons; and for the 6-in. quick firer, eight rounds per minute, with an energy of 4840 foot-tons per minute—all of which are possible of realisation. Although it may be urged that in action these results might not be attained, the assumptions are fair as a basis of comparison. Indeed, it may be safely accepted that the later cruisers are likely to attain greater rapidity of fire, as well as higher ballistics, in view of the steady advance in ordinary practice, especially if, as is probable, armour-piercing shell is adopted with the use of a nitro-cellulose powder, which greatly increases the velocity and the energy. The use of both elements in other countries is so universal, and the improvements resulting so great, that the change must come sooner rather than later. The recent trials of capped shot and shell at the Eskmeals range demonstrated that the 6-in. and 7·5-in. guns were superior to 6-in. plates, even when fired at an angle, while nitro-cellulose has increased the ballistics of guns by 10 per cent. as compared with cordite, so that the figures which we give in the appended table, may, in reality, show a greater advantage for the modern ship.

FIRE OF PRIMARY ARMAMENT PER MINUTE.

Duke of Edinburgh (13,500 tons)	24 at 380 lb.	= 9,120 lb.	and 441,600	foot-tons.
	80 at 100 lb.	= 8,000 lb.	and 387,200	,,
	104	= 17,120	828,800	,,
Drake (14,100 tons)	8 at 380 lb.	= 3,040 lb.	and 147,200	,,
	128 at 100 lb.	= 12,800 lb.	and 619,520	,,
	136	= 15,840	766,720	,,

FIRE OF PRIMARY ARMAMENT PER MINUTE—*continued*.

Devonshire (10,700 tons)	10 at 200 lb. =	2,000 lb. and	101,200	foot-tons.
	80 at 100 lb. =	8,000 lb. and	387,200	,,
	90	= 10,000	488,400	,,
Kent (9800 tons)	112 at 100 lb. =	11,200 lb. and	542,080	,,

It will be seen that although the displacement tonnage of the Duke of Edinburgh is less than that of the Drake, being 13,500 tons as compared with 14,100 tons, there is an increase in the weight of shot which may be fired per minute of from 15,840 lbs. to 17,120 lbs., and in the total collective muzzle energy from 766,720 to 828,800 foot-tons.

The machinery of the Duke of Edinburgh is to weigh 2250 tons, is being constructed by Messrs. Hawthorn, Leslie & Co., and is to develop 23,500 I.H.P. Steam will be supplied by six cylindrical and twenty Babcock & Wilcox water-tube boilers. A feature of the design is that a portion of the double bottom will be fitted as tanks for the storage of oil fuel. The coal capacity at load draught is 1000 tons.

Four armoured cruisers are to be laid down in 1903–4, one at Pembroke and three in private yards.

Second class cruisers.

The Challenger, laid down December 1, 1900, was launched at Chatham on May 27, and the Encounter, laid down at Devonport on February 23, 1901, was launched on June 18, 1902. The dimensions of these ships are as follows:—Length, 355 ft.; beam, 56 ft.; draught of water aft, 21 ft. 3 in.; displacement, 5880 tons. The estimated speed is 21 knots with 12,500 I.H.P. The armament consists of eleven 6-in., eight 12-pdr., and six 3-pdr. Q.F. guns, six Maxims, and two submerged torpedo tubes. Protection is given by a deck 1½ in. thick in the flat, and 3 in. thick on the slopes over the engines and boilers, and 1 in. thick before and abaft the machinery spaces. The coal carried at load draught is 500 tons, the maximum capacity being 1225 tons. The engines of the Challenger are by the Wallsend Engineering Co.—a new firm—those of the Encounter will be made at Keyham. The Challenger has twelve boilers of the Babcock & Wilcox type, the Encounter twelve Dürr boilers. The estimated cost of the ships is respectively £381,131 and £398,971, to which must be added £25,760 for cost of armament. They will have a complement of 499 officers and men. These cruisers represent a useful type which might with advantage be multiplied in the British Navy. They have fair speed and a fair armament for their size. Their predecessors until rearmed were sadly deficient in both.

Third-class cruisers.

In the *Naval Annual* of last year it was stated that two cruisers of 3000 tons displacement were to be built—the Amethyst, at Elswick, and the Topaze, by Messrs. Laird. The speed under natural

draught is 20 knots with 7000 I.H.P., under forced draught 21·75 knots with 9800 I.H.P. The coal capacity at load draught is only 300 tons. The armament comprises twelve 4-in. and eight 3-pdr. guns. The Amethyst, laid down January 7, 1903, will be fitted with Turbine machinery by the Parsons Turbine Company and modified Yarrow boilers. The Topaze, laid down August 14, 1902, will be fitted with the ordinary reciprocating machinery, and will have boilers of the Laird-Normand type. Two other cruisers of the same type have been laid down, the Diamond at Birkenhead, and the Sapphire at Messrs. Palmer's yard, Jarrow-on-Tyne.

For the multifarious duties which will fall to the Navy in time of war we must have numbers. To fulfil many of these duties it is a waste of power to employ a Drake or a Devonshire, and we could not have Drakes in sufficient numbers. During the blockade of Brest, which extended over two years, and included the blockade of the French and Spanish ports in the Bay of Biscay, there was a constant demand for vessels of the smaller sizes. The new cruiser class will be of value for the protection of commerce where it most needs protection, viz., when converging on the Channel and passing up the Channel, against small cruisers or privateers. Three cruisers of this class will be laid down in 1903–4.

Scouts. During the autumn of 1902 the leading shipbuilding firms were asked to submit tenders and designs for four unprotected cruisers to act as scouts. The Adventure is building at Elswick, the Forward at Fairfield, the Sentinel by Messrs. Vickers, Maxim & Son at Barrow, and the Pathfinder by Messrs. Laird at Birkenhead Their dimensions are as follows:—

	Displacement.	Length.	Beam.	Mean Draught.	I.H.P.
		Ft.	Ft.	Ft.	
Adventure	2750	370	38	13¼	16,000
Forward	2545	360	38½	13	16,000
Sentinel	2900	360	40	14¼	17,000
Pathfinder	2610	360	38	13¼	16,000

The speed is to be 25 knots. The coal supply will be sufficient for 3000 nautical miles at 10 knots: the supply at load draught will be 150 tons. The armament will consist of ten 12-pdr. and eight small automatic guns. Four scouts are to be laid down in 1903–4.

Sloops. The sloops, Odin and Merlin, have been completed. The Odin, which is fitted with Babcock & Wilcox boilers, attained a speed of 13·64 knots on her trials with 1420 I.H.P. The Merlin, which

has boilers of the Belleville type, steamed 13·43 knots with 1460 I.H.P. In the last number of the *Naval Annual* we pointed out that these vessels represented no advance on their predecessors of fifteen years ago in gun power or speed. They cost £90,000, require a complement of over 100 men, and are absolutely valueless for purposes of war. The Cadmus and Clio, of the same type, have been launched at Sheerness. It is to be hoped that they will be the last of the type to be laid down.

Destroyers completed.

The Arab, built by Messrs. J. Brown & Co., Clydebank, was designed for a speed of 32 knots. She is fitted with Clydebank-Normand boilers. On her trials she attained a speed of 30·89 knots with 8792 I.H.P., and a coal consumption of 2·45 lbs. The Arab and Express (which was designed for a speed of 33 knots) have been commissioned. The Lively and Success (which attained a speed of 30·22 knots on her trials), the last of the destroyers ordered prior to 1901–2, have been passed into the Fleet Reserve.

New type of destroyers.

The disaster to the Cobra, and the want of structural strength * displayed by other destroyers under the conditions in which they have been employed, which were hardly those contemplated when they were designed, has resulted in a complete change of policy as regards the construction of this class of vessel. In the nineteen destroyers now building, the displacement is increased from 540 to 600 tons. They will be of stronger construction and, as they have a forecastle instead of a turtle-back deck, will be more habitable at sea; but the speed at deep-load draught has been reduced to 25½ knots. These vessels will belong rather to the class of torpedo gunboats, than to that of destroyers. Their displacement will exceed that of the Spider and the Sandfly, two of the earliest of the torpedo gunboats (viz., 525 tons), and though they should be superior in speed to the 30-knot destroyers in a sea way, they will hardly serve the purpose of the latter in fair weather. The Exe, Ettrick, Erne, Cherwell, and Dee are building at Jarrow, and will be fitted with Reed boilers. The Erne was launched on January 14, 1902:—Length, 225 ft.; beam, 23 ft. 6 in.; I.H.P., 7000. The Ribble, Usk, Teviot, and Welland, building at Poplar, will be fitted with Yarrow boilers. The Itchin, Foyle, Arun, and Blackwater, are being constructed by Messrs. Laird, at Birkenhead, and will have Laird-Normand boilers, The Derwent, Eden, and Waveney, building by Messrs. Hawthorn Leslie & Co., will be fitted with modified Yarrow boilers. The Kennet and Jed, building by Messrs. Thornycroft, will be fitted with Thornycroft boilers. The Velox and the Eden will be driven

* The Wolf has been subjected to a series of experiments to test the hogging and sagging stresses.

by steam turbines. The following description is extracted from the *Naval and Military Record:*

With regard to the application of the steam turbine to war vessels, the Velox differs considerably in constructive details from the Turbinia, Viper, and Cobra. Mr. Parsons had found that the Viper and the Cobra were not so economical as could be wished when running at ordinary cruising speeds.

The arrangement arrived at in the Velox is as follows: The main propelling machinery consists of two independent sets of Parsons turbine engines, one high-pressure and one low-pressure engine being on each side of the vessel. This gives four turbines, each of which has its own line of shafting, and as each shaft carries two propellers, there are eight propellers in all. The high-pressure turbines drive the outer shafts, and the low-pressure turbines the inner ones. For going astern reversing turbines are incorporated in the exhaust-casing of each of the low-pressure cylinders. A novel feature in this vessel is the introduction of ordinary reciprocating engines fitted in conjunction with steam turbines. These engines are of the triple-compound type, and are coupled direct to the main turbines, and work in conjunction with them. They take steam directly from the boilers, and exhaust through the high-pressure turbine; the exhaust from the latter passing in turn through the low-pressure turbine, and from thence to the condensers. These reciprocating engines are for use at cruising speeds, when low power only is needed, and are, therefore, of comparatively small size. When higher powers than those required for absolute cruising speeds, under ordinary conditions, are needed, steam will be admitted to the turbines direct from the boilers, and when the highest speed is needed, which would bring the rate of revolution beyond that permissible with reciprocating engines, steam will be entirely cut off from the latter, they being at the same time thrown out of gear, and the steam turbines alone would be used. With this arrangement the Velox will doubtless prove an exceptionally economical destroyer at cruising speeds. The boilers are of the Yarrow type, and have been made by Messrs. Hawthorn, Leslie & Co., who are also the builders. She is 210 ft. long, 21 ft. wide, and 12 ft. 6 in. moulded depth. The maximum speed made by the Velox up till now is 33·64 knots.

Torpedo boats.

Five torpedo boats of 25 knots' speed are being built by Messrs. Thornycroft and will have Thornycroft boilers. No. 109 was launched on July 22, No. 110 on September 5, No. 111 on November 1, 1902, No. 112 on January 15, No. 113 on February 12, 1903. On trial No. 109 has attained a mean speed of 25·2 knots with 2740 I.H.P. The four boats of last year's programme building by Messrs. White, of Cowes, will have White-Forster boilers.

Accidents.

There have been some accidents as usual with destroyers. The Recruit ran ashore in a dense fog off the Land's End, but was got off and repaired at Devonport. The Orwell was cut in two at the fore bridge by the Pioneer during the manœuvres of the destroyer flotilla in the Ionian islands and fifteen of her crew were drowned or killed. The after part of the destroyer was towed stern foremost to Corfu.

Since the changes made by Lord Goschen, our naval officers have had less sea-training than formerly, though high speeds require greater training for the eye. Want of sea-training will be intensified under the new scheme, where the officers spend a large proportion of their time in the engine-room. In cases where courts of inquiry have followed these accidents, officers have been held to blame.

Six submarines have been completed during the year. Little has been published as to the result of their trials, but nothing that has transpired leads to a modification of the opinion expressed last year as to the value of the submarine boat. Ten submarines of increased displacement are to be laid down in 1903–4. Sub-marines.

Private firms are now permitted to complete vessels to the last stages of placing the armament on board. The functions of the Royal Dockyards in the case of contract-built ships, will in future be confined to providing the stores and crews. Sensible economies should be effected by this arrangement which was strongly urged in the preface to the *Naval Annual* of 1902. Economies are also hoped for from the general movement towards standardisation of engineering materials used in warship equipment. It has been stated officially that Government orders of all kinds control fifty million pounds worth of manufactured goods, so that a great deal can be done by Government in standardising. A new departure has also been made in allowing private firms to design the four new scouts. New policy in construction.

The refit of the battleships of the Royal Sovereign class includes the mounting of the six 6-in. upper-deck guns in casemates. During the year this important improvement has been effected in the Empress of India, Resolution, Revenge, and Royal Oak. The Hood is in hand at Devonport, and the Ramillies, Repulse, and Royal Sovereign will be refitted in 1903–4. The Admiral class, of which the Howe is to be refitted by Messrs. Palmer, at Jarrow, cannot be considered fit to take their place in the line of battle in their present condition. Their vitals and heavy guns are well protected. Their principal defect is the want of protection for the secondary armament. Were four 6-in. guns in casemates substituted for the six 6-in. guns now mounted—an alteration which could be made without adding materially to the displacement (as the existing thwartship bulkheads would provide one side of the casemates), and at moderate cost—they would still be effective ships. The Colossus is to be refitted by the Thames Ironworks Co., at Blackwall. The giving over of repair work to private builders is a new departure which will relieve the pressure in the Government dockyards. Lord Selborne speaks of the result with satisfaction, but it may be doubted whether the plan is economical. Repairs and refits. Battle-ships.

The Diadem class, the last of which, the Spartiate, has barely been completed, have always been in dockyard hands for repair. The Europa, on her trials after an extensive refit, which included repairs to boilers, steamed 20·5 knots with 16,823 I.H.P., and the high coal consumption of 2·15 lbs. The Diadem has been sent to Fairfield and the Niobe to Barrow. According to the return presented to Cruisers.

Parliament, on October 17, 1902, the Europa has already cost £31,693 for repairs to engines and boilers, although only one year in commission. The Diadem, which has been in commission three years and seven months, has cost £15,510, whereas, of the Edgar class, which are fitted with Scotch boilers, the Royal Arthur, though eight years and seven months in commission, has only cost £6,453 for repairs to engines and boilers, and none of her sister ships, except the Edgar, have cost more than £7,121.

The Powerful has had four 6-in. guns in casemates added to her armament. On a two hours' trial after re-fit, the mean speed was 21·2 knots, and the maximum speed 21·6 knots. The Belleville boilers, which have been in the ship seven years, gave no trouble. The maximum speed ever attained by the Powerful was 22·1 knots. On her contract trials she steamed 21·8 knots—the draught was then 15 in. less than on her trial after refit. The Terrible is to receive a similar addition to her armament.

The substitution of 6-in. for 4·7-in. guns has been effected in the second-class cruisers, Doris, Venus, Dido, and Isis.

The second-class cruiser Hermes was commissioned in October, 1899, but broke down almost immediately. She has been fitted with new boilers by Messrs. Harland and Wolff, of Belfast. The boiler trials with her sister ships, the Hyacinth and Minerva, were still in progress at the end of 1902.

Torpedo gunboats.

Several torpedo gunboats have been refitted, and a very considerable improvement on the speed for which they were designed obtained. The cost of refitting these vessels averages about £52,000, or not far short of the original cost. It is very doubtful if the refit is worth the money. The Gossamer and the Niger have been fitted with new engines and Reed water-tube boilers by Messrs. Palmer, Jarrow-on-Tyne. On the full-power trial the Gossamer steamed 20·32 knots, with 6058 I.H.P. On the measured mile she subsequently steamed 20·7 knots with 5969 I.H.P. She was originally designed to steam 19 knots with 3600 H.P. The displacement of the Niger is 810 tons, as compared with the 735 tons of the Gossamer. Her original trial speed was 19¼ knots. On her recent full-power trial she steamed 20·5 knots with 6282 I.H.P. The Circe, Halcyon, Jason, and Leda, are in hand.

Vessels struck off the list.

Besides smaller vessels, the battleships Agamemnon and Ajax, the coast defence ships, Cyclops, Gorgon, Hecate, and Hydra, the torpedo ram Polyphemus, and the torpedo gunboat Spider, have been placed on the non-effective list, in order to be sold. The Agamemnon, which originally cost over half a million, having been put up to auction, fetched £20,000. The battleship Inflexible, and the Monarch, which

was recently re-fitted at a cost of £135,000, have also been placed on the non-effective list. The Swiftsure is to be converted into a workshop for the Fleet Reserve. The Alexandra is to be stationed off Osborne as the new cadet's training ship. The Bellerophon is being disarmed and is to be used at Devonport as an instructional ship for stokers. The fitting of the Nelson as a training ship exclusively for stokers at Portsmouth is proving most satisfactory. The Audacious, Warrior and Triumph have been turned into depôt ships for destroyers. The Téméraire becomes Fleet Reserve depôt ship at Plymouth.

Storage of coal.

The dockyard officials at Portsmouth have been ordered to investigate the storage of coal immersed in sea water. The following are the chief points of the inquiry:—(*a*) Whether it is recommended to conduct experiments to ascertain the results of storage under water; (*b*) if so, to what extent and whether the experiments should be by immersion in a tank or well on shore or afloat by sinking a lighter full of coal; (*c*) where it is proposed the experiments should be carried out; (*d*) whether wetted coal is considered dangerous for issue to ships; (*e*) if it is considered the coal so immersed would require to be dried before issue, and, if so, how is it proposed to do this if large quantities of coal were stored under water for issue to ships; (*f*) whether an opinion can be furnished as to the respective merits of stored coal under cover and under water.

Personnel.

The numbers to be voted for the Navy in 1903–4 are 127,100 —an increase of 4600 in the numbers voted in 1902–3. The constant increase to the permanent force is to be deplored, and it is to be hoped that action will be taken on the lines of the report of Sir Edward Grey's committee. An increase of the Royal Naval Reserve from 25,580 to 26,600 officers and men is provided for under Vote 7. This includes an increase of 600 in the firemen reserve, and 600 Royal Naval Reserve men in Newfoundland. There is a satisfactory addition of 2000 men to the Non-Pensioner class of the Fleet Reserve, while the Pensioner class is only diminished by 200 men.*

Gunnery

The importance of gunnery † has been emphasised by Lord Selborne, and the value of accurate shooting to the efficiency of a ship of war can hardly be exaggerated. The following table (see Table I on next page), taken from the *Times*, gives the percentage of hits per gun per minute for the three years 1899–1901.

The returns of the annual prize-firing with heavy guns shows, as usual, an extraordinary difference between the performances of

* Cf. First Lord's Memorandum. Questions relating to the *personnel* are discussed at greater length in Chapter VIII.

† Cf. Part III. Chapter III.

TABLE I.

	1899.	1900.	1901.
16·25 and 13·5-in.	·14	·12	·16
12-in. Mark VIII	·28	·30	·33
12-in. Mark I to VII	·13	·10	·12
10-in. B.L.	·26	·39	·35
9·2 in. Mark VIII	—	·75	1·16
9·2-in. (less than Mark VIII and 8-in.) .	·23	·20	·28
6-in. Q.F.	1·05	1·51	1·81
6-in. Q.F.C.	·85	·66	·78
5-in. and 4-in. B.L.	·43	·50	·34
4·7-in. and 4-in. Q.F.	1·86	1·60	1·93

different ships. Thus, with the 13·5-in. gun, the Royal Sovereign and Hood made ·25 hits per gun per minute to ·12 hits made by the Trafalgar and Ramillies. With the 12-in. Mark VIII gun, the best ship, the Ocean, made ·58 hits and the Mars ·45 hits per gun per minute, and the worst ship, the Goliath, only ·20. With the 9·2-in. gun the highest figure, the Orlando's, was ·41, the lowest ·16. With the 6-in. Q.F. gun the Cambrian made only 2 hits and the Hood 2·1 hits, while the Terrible made 4·25 hits per gun per minute. This rate was exceeded by the Crescent, flagship on the North American station, at her prize-firing on May 9, 1902, of which the following were the remarkable results :

6-IN. Q.F. 3-MOTION MECHANISM. C.P.1. MOUNTINGS.

Gun.	Rounds.	Hits.	Rate of hits per minute.
1	14	12	6
2	13	12	6
3	12	11	5·5
4	12	11	5·5
5	13	10	5
6	12	10	5
7	11	9	4·5
8	12	8	4
9	10	7	3·5
10	12	5	2·5
11	9	5	2·5
12	9	5	2·5
	139	105	

Average of rounds per gun per minute . . . . 5·79
,, hits ,, ,, ... 4·37

9·2-in. B.L. Mark VI. Mark III Mounting.

Rounds.	Hits.
10	9

Average of rounds per gun per minute . . . . ·83
,, hits ,, ,, ... ·75

The difference in results obtained by different ships may be partly accounted for by the fact that the annual prize-firing is not

and cannot be carried out under the same conditions; but it may be attributed even more largely to the varying degrees of trouble taken in this important branch of their work by the officers of the ships. The prize-firing returns are no longer to be published, which seems a pity. Publicity, if not to be upheld in H.M. Navy as an incentive to excellence, is at any rate a check on inefficiency.

Merchant cruisers. The "Morgan combine."

The question of mercantile auxiliaries has been prominent during the past year. The formation of the International Navigation Company with a capital of £24,000,000, in addition to £15,000,000 of debenture bonds, by Messrs. J. S. Morgan & Co., to acquire the White Star, the Dominion, the American, the Red Star, the Atlantic Transport, and the Leyland lines, representing in the aggregate about one million tons, aroused considerable alarm in the country as to the future of British shipping, which was accentuated by the fact that three of the vessels belonging to the White Star Company had an ocean speed of 20 knots, and were in receipt of an Admiralty subvention, while three others were held at the disposition of the Admiralty without subvention. The number of ocean steamers with a continuous sea speed of 19 knots or more belonging to the various countries is as follows:

Britain.		Germany.		France.		United States.	
Name.	Speed.	Name.	Speed.	Name.	Speed.	Name.	Speed.
	kts.		kts.		kts.		kts.
Lucania .	21	Deutschland . .	23	Lorraine.	20	St. Louis .	22
Campania.	21	Wilhelm II . . .	23	Savoie .	20	St. Paul .	22
Teutonic .	20	Kronprinz Wilhelm	23	Aquitaine	19	Paris . .	20½
Majestic .	20	Wilhelm der Grosse	22	Touraine	19	New York	20½
Oceanic .	20	Wilhelm III . .	22				
Umbria .	19	Bismarck	20				
Etruria .	19	Maria Theresa . .	20				
		Columbia . . .	19				
		Augusta Victoria .	19				

The supremacy in speed has passed from our hands to those of the Germans, who now possess five vessels with a speed of 22 to 23 knots. The latter speed has on several occasions been maintained for the whole voyage across the Atlantic. The fact that foreign powers possess ships which no British ship, whether belonging to the Royal Navy or the Mercantile Marine, can equal in speed is the main justification for the action taken by the Government to prevent the Cunard Company also joining the combine.

The Cunard agreement.

The Cunard Company is to remain British, and its whole fleet is to be at the disposal of the Admiralty in consideration of: (1) An advance by the Government of a sufficient sum to build two steamers faster than any merchant ship afloat, at $2\frac{3}{4}$ per cent. interest, the capital sum to be repaid over twenty years, and until it is

repaid the Government to hold a mortgage on the Company's property. (2) The Admiralty's annual subvention to be increased to £150,000.

The assistance given to the Cunard Company in order to secure for the national service in time of war two mercantile auxiliaries possessing a speed of 25 knots therefore fulfils two of the conditions suggested by the Committee, a summary of whose recommendations we give below; but it is one which is too costly to be repeated on an extended scale for ships of such high speed. The main value of the agreement is probably as a warning to the foreign capitalist, who controls tens of millions of capital, that he has the British Government to deal with when he seeks to acquire the control of an interest which is of vital moment to the people of this country.

Committee on mercantile auxiliaries.

A committee consisting of Lord Camperdown, Vice-Admiral Fitzgerald, Professor Biles, Mr. Robert Chalmers, of the Treasury, and Mr. Forman, representing the Post Office, was appointed to report in what manner and at what cost vessels can be secured which (*a*) shall combine greater speed with a large radius of action (no subsidy to be given for a lower speed than 20 knots); (*b*) shall be capable of carrying an armament of at least 4·7-in. guns; (*c*) shall be subdivided as under the present system; (*d*) shall possess a steering gear below the water-line if this does not entail too great a cost; (*e*) when once subsidised shall not be transferred to a foreign flag without the consent of the Board of Admiralty. The Committee reported that the cost might be provided in three ways, either by (i) the Admiralty guaranteeing a sum representing the first cost of each ship, thus enabling the shipowner to raise the capital at 3 per cent. instead of 5 per cent., which he would otherwise have to pay; (ii) the contribution on the part of the Admiralty of a lump sum towards the first cost of the ship, thereby reducing the outlay on the part of the shipowner; (iii) an annual payment extending over an agreed period of years. Adopting the principle of an annual payment, they estimated the first cost of ships having a speed of from 20 to 26 knots, and the subsidy which they believed it would be found necessary to guarantee for a period of ten years as follows:

Average Ocean Speed.	First Cost, Building, &c.	Engine Power.	Annual Subsidy.
Knots.	£	I.H.P.	£
20	350,000	19,000	9,000
21	400,000	22,000	19,500
22	470,000	25,500	40,500
23	575,000	30,000	67,500
24	850,000	40,000	110,500
25	1,000,000	52,000	149,000
26	1,250,000	68,000	204,000

The Naval Review on the occasion of the Coronation of H.M. King Edward VII was postponed from June 28—the date originally fixed—on account of His Majesty's illness, to August 16. The number of ships present at the three reviews of 1887, 1897, and 1902 is shown in the following tabulated statement: Naval review.

Class.	1887.	1897.	1902.
Battleships . .	19	21	20
Cruisers . . .	19	43	24
Torpedo Craft .	72	82	47

The Fleet at Spithead in 1902 comprised the Channel, Home, and Cruiser Squadrons, with the torpedo boat destroyer flotillas attached to the home ports and several vessels in commission for special purposes. No ships hoisted the pennant merely for the purpose of swelling the numbers at the review. The oldest battleship represented was the Devastation, launched in 1871; the most modern, the London, which however left for the Mediterranean before August.

In consequence of the postponement, nearly all the foreign ships which had come over for the Review in June were absent in August. France was represented in June by the Montcalm, Germany by the Kaiser Friedrich III, Russia by the Pobieda, the United States by the Illinois, Italy by the Carlo Alberto, Japan by the Asama and Takasago, Spain by the Emperor Carlos V, Portugal by the Don Carlos I, Norway by the Norge, Sweden by the Oden, the Netherlands by the Holland, Denmark by the Herluf Trolle, Greece by the Psara, Chili by the Chacabuco, and the Argentine Republic by the Presidente Sarmiento.

The year 1902 witnessed a provisional agreement for an increase in the annual Colonial Naval contribution to £328,000. This agreement is subject to the ratification of the Colonial Parliaments. The following is a summary of the changes:—Contribution of Australia increased to £200,000 a year towards the cost of an improved Australasian Squadron and the establishment of a branch of the Royal Naval Reserve. Colonial conference.

Contribution of New Zealand increased to £40,000 a year towards an improved Australasian Squadron and the establishment of a branch of the Royal Naval Reserve.

Contribution of Cape Colony increased to £50,000 per annum towards the general maintenance of the Navy.

Natal to contribute £35,000 per annum towards the general maintenance of the Navy.

Newfoundland to contribute £3000 per annum (and a capital sum of £1,800 for fitting up and preparing a drill ship) towards the maintenance of a branch of the Royal Naval Reserve of not less than 600 men.*

Owing to the prolonged drought in Australia, which had imposed the necessity of drastic economies on the Governments of the Australian Colonies, owing to the fact that the first aim of the South African Colonial Governments must be to repair the damage wrought by the war, the moment was not propitious for discussing an increase of colonial contributions to the naval defence of the Empire. The results of the Conference were, however, not unsatisfactory. By the agreements above described, and by the decision that a conference of colonial premiers should meet at intervals of not more than four years, the two great principles underlying Imperial Federation were admitted—the duty of each part of the Empire to contribute to the common defence, the right of each part of the Empire so contributing to a voice in the direction of Imperial policy. When we are prepared to give the Colonies constitutional representation in the councils of the Empire, and not till then, is it reasonable to expect them to take upon their shoulders a fair share of the burden of Imperial defence.

* The Ariadne and Charybdis each embarked 50 fishermen for their winter cruise.

CHAPTER II.

Foreign Navies.

France.

The discussions which have taken place during the year under review on the true object of French naval policy are of general interest. M. Pelletan, the present Minister of Marine, holds strong views, which he developed in the debate in the Chamber on February 6th, 1903. "I do not ask," he said, "what ironclads really are, and what surprises may be reserved for us by great naval battles. No one has any idea whatever. But what we do see is that in anticipation of this great battle we Frenchmen are in a manifestly unfavourable position. For the chances of victory are all on the side of the Power that can send into action the largest number of ironclads, and as each unit may cost from 30 to 40 million francs, the determining factor in victory is the longer purse. Can France, therefore, rival England, which has a naval budget two and a half times bigger than that of France? And it is not merely England that is in question. France has been until recently the second naval Power in the world. At present there are rivals on every hand seeking to outstrip France. If Germany and the United States enter the field, how can France continue the struggle? Now, to base the policy of France on the ideal of the old school would be of the utmost rashness." * M. Pelletan further put in a strong plea in favour of greater speed, and referred to coaling stations as a primary necessity, asserting that every centime taken from them was so much deducted from French naval defence.

In an exceedingly able criticism of M. Pelletan's speech which appeared in *Le Yacht* of February 14th, "H. Marin" points out that, whether fighting power or speed (as suggested by M. Pelletan) be the object aimed at in French naval construction, both require large dimensions and a heavy expenditure. In the latter it is impossible for France to compete with England. The command of the sea can only be obtained by fighting for it. "L'avantage appartiendra à celui qui saura le mieux discerner là où il faut frapper et qui saura frapper le plus fort."

Various causes have contributed to retard the French shipbuilding programme—the views of the Minister already quoted; Summary of progress.

* *Times* Report.

the resulting tendency to delay the commencement of the battleships referred to below; the discussions which have been raised by the unusual procedure adopted; the necessity of financial retrenchment; and the slow progress of some of the vessels in hand. The battleship République (Brest), the armoured cruisers Kléber (Bordeaux) and Amiral Aube (St. Nazaire), and several torpedo craft, have been launched. The following have been completed: the battleship Iéna, the armoured cruiser Montcalm, the "commerce destroyer" Châteaurenault, the destroyer Pertuisane, the sea-going torpedo boats Typhon, Bourrasque, and Rafale, many first-class boats, the submersibles Sirène, Triton, Espadon, and Silure, and the submarines Korrigan and Farfadet. The following new cruisers have been brought forward for their trials: the Jurien de la Gravière, Gueydon, Marseillaise, Dupleix, Kléber, and Desaix. The Dupetit-Thouars, Amiral Aube, Gloire, Condé, Sully, and Léon Gambetta are expected to undergo trials in 1903. According to a French Parliamentary paper issued in January, forty-nine vessels are to be laid down in the course of the year. Of these, four destroyers, one large submarine, eighteen other submarines, and one colonial torpedo boat are to be built in the dockyards, while one armoured cruiser (the Ernest Renan, of 13,351 tons displacement) and twenty-four torpedo boats are to be constructed in private yards.

Battleships completing.

The second-class battleship Henri IV., launched in 1899, made her preliminary trials in November, 1902, when her engines and boilers were reported to have given satisfaction. The former were made at Indret; the latter are of the Niclausse type. It has since been announced that some modification in the engines will be necessary, and the completion of her trials has been retarded in consequence. The Henri IV. is of 8807 tons displacement. The estimated speed with 11,500 I.H.P. is 17 knots. Protection is afforded by a water-line belt of a maximum thickness of 11 in., above which there is thinner armour 4¾ to 3¼ in. thick, extending to the height of the main deck for two-thirds of the length from the bow. The armament comprises two 10·8-in. guns, mounted in barbettes forward and aft, protected by 11¾-in. Harveyed steel armour, and seven 5·5-in. guns, of which three are mounted on each side amidships, and one in a small turret aft, firing over the top of the 10·8-in. barbette. The normal coal capacity is 735 tons, the maximum 1100 tons. The cost of the ship is £801,248.

Suffren.

The battleship Suffren, which was launched in 1898, has been going through her trials. She has already been described in the *Naval Annual*. The Suffren is undoubtedly a powerful ship,

especially in defensive qualities. A water-line belt, 12 to 8 in. thick, extends the whole length of the ship. The armoured deck, which reinforces the water-line protection, is $2\frac{3}{4}$ in. thick, and, as is common in recent French ships, there is a second protective deck of $1\frac{1}{2}$-in. armour at the upper edge of the belt. The French practice has been copied in some recent British designs, *e.g.*, in the Duncan class, and is adversely criticised in Part III., Chapter I. Above the belt for 325 ft. from the bow, the side is protected between the lower and main decks by armour 5 in. thick amidships, tapering to 3-in. at the bow.

The battleship République, of 14,630 tons displacement, which was described in the *Naval Annual* of last year, was launched at Brest on September 4. The distribution of the secondary armament is an important feature in the République. Of the eighteen 6·4-in. guns twelve are mounted in pairs in turrets on the hurricane deck, two are mounted in casemates forward on the upper deck, and four in casemates amidships on the main deck. The French, therefore, prefer the casemate system to the continuous battery of the Mikasa, King Edward, and other recent battleships. An important modification is however introduced in the secondary armament of the later ships of the class (Démocratie, Justice, Liberté, Vérité) in the direction of larger calibre and reduced number. In place of the eighteen 6·4-in. guns there will be ten 7·6-in. guns, six mounted in turrets and four in casemates. The minor armament will be reinforced by eight 3·9-in. guns, while the number of 1·8-in. guns will be reduced from 26 to 16. The estimated speed, 18 knots; the coal capacity, 900 tons normal and 1850 tons maximum; and the radius of action 8390 miles at 10 knots with bunkers full, are approximately the same for all six ships.

République class.

The *Engineer* thus compares the gun power of the République with that of other battleships:—

The artillery predominance of the République is very marked, save against the New Jersey. If, however, we reduce all guns to the common denomination of the 12-pdr., we get the total fire values for one broadside as follows:—New Jersey, 99; King Edward, 78; République, 71; "H and J," 69; Vittorio Emanuele, 61; Suffren, 60.

This cannot be taken as absolutely representing their relative gun powers, because it ignores the penetration factor altogether, and this, though perhaps correct enough in the main, is still not to be ignored in the case of the King Edward's 9·2's, or the 8-in. pieces of the American and Italian ships. The 9·2's in particular give the King Edward a power against medium armour that the other ships do not possess, save, maybe, on paper. Still the comparison is approximately fair enough to help us to assess the relative values of the ships more surely than we may hope to do by merely putting down the guns themselves. And carrying on the principle we can, by dividing the displacements into these figures, place the values of the ships in gun-fires per thousand tons of displacement as follows:—New Jersey, 6·5; "H and J," 5·2; Vittorio Emanuele, 4·8; King Edward, 4·7; République, 4·7; Suffren, 4·7.

The engines of the République are being constructed by the Chantiers de la Loire.

Battleships to be laid down. The République, Patric (building at La Seyne), and the four other battleships belong to the programme of December, 1900, voted when M. de Lanessan was Minister of Marine. M. de Lanessan had ordered A 13, or Justice, to be built by the Chantiers de la Loire at St. Nazaire; the A 14, or Vérité, at Bordeaux; A 11, or Liberté, at La Seyne; and A 12, or Démocratie, at the Government yard at Brest. In consequence mainly of the anticipated deficit in the Budget, M. Pelletan, the present Minister of Marine, ordered the work on these four ships to be stopped. The private firms, which had entered into contracts, and had ordered material for the ships, thereupon instituted proceedings against the Government. Owing to the feeling displayed in the French Chamber, which passed a unanimous vote in favour of proceeding with these ships on November 13th, the programme will be carried through, though possibly with some delay.

Battleship reconstruction. In 1902 the reconstruction of the Magenta and Dévastation, and of the coast defence armour-clads Indomptable, Requin, and Caïman, was completed, and that of the battleship Marceau begun. The Dévastation on her trials after her refit attained a speed of 14·95 knots with 8460 I.H.P. The re-armament of the Courbet and Dévastation has made them in some respects superior to our Admiral class. They have been supplied with Belleville boilers. The principal features in the reconstruction of the Requin were the substitution of 10·8-in. for 16·5-in. guns, and of 10-in. Harvey nickel steel for the 17¾-in. compound armour in the barbettes. The work upon the Neptune, Duperré, and Furieux, which was to have been begun in 1901, has been deferred.

Cruisers. The armoured cruiser Jeanne d'Arc has given much trouble on her trials, and has not yet succeeded in attaining the contract speed. On her coal-consumption trial she attained a speed of 19·97 knots with 20,600 I.H.P. The official trial at full speed took place on January 23. The engines developed 30,000 I.H.P., but the speed obtained was only 21·8 knots, instead of 23 knots. The coal consumption was 2·2 lbs. On her gunnery trials the vibration of the hull is reported by the *Matin* to have been so great that no gun could be laid.

Châteaurenault. The commerce destroyer Châteaurenault also gave trouble from the vibration of her hull aft. This defect has been remedied, and on her trials on July 25 she attained a speed of 24·19 knots with 24,300 I.H.P. and 131 revolutions. She has been commissioned for service in Eastern waters.

The armoured cruiser Desaix, of 7578 tons displacement, arrived at Cherbourg in November, from St. Nazaire, for her trials. The Kléber, sister ship to the Desaix, was launched, complete with her engines, boilers, armour and armament, at Bordeaux, on September 20. The *Patrie* states that this has proved to be a most unfortunate experiment, as the heavy weight borne by the hull when out of the water seriously strained the vessel. The Kléber arrived at Cherbourg for her trials in January. The Dupleix is undergoing her trials at Rochefort. Desaix class.

The Gueydon, of 9517 tons displacement, 21 knots speed, attained a speed of 18·4 knots with 14,000 I.H.P. and a coal consumption of 1·72 lbs. For one hour she is reported to have attained a speed of 20·316 knots. The Montcalm steamed 20·85 knots with 18,300 I.H.P. She has been commissioned. The Dupetit-Thouars is not yet ready for her trials. Montcalm class.

The Condé class (displacement 9858 tons) includes the Gloire, Sully, Amiral Aube, and Marseillaise. These ships are improved Montcalms. Whereas the 6-in. guns of the latter are carried in casemates unprotected at the bases, those of the former are mounted half in closed turrets, half in casemates with protected bases. The Marseillaise on her coal-consumption trial steamed 18·562 knots, with a coal consumption of 1·35 lbs. *Le Yacht* reports that when the rudder was put hard over some of the plates aft became bent and a few rivets started. The inflow of water only affected one compartment, but the ship had to go into dock for repairs. In February, 1903, one wing broke off her starboard propeller when under trial, and in going into the port at Brest, she touched the ground and received some damage. The repairs will occupy several months. The Amiral Aube was launched at St. Nazaire on May 9. The Sully on her preliminary trials attained a speed of 20·42 knots with 16,850 I.H.P. Condé class.

The Léon Gambetta, of 12,351 tons displacement, launched in 1901, at Brest, has received her engines and boilers, and is well advanced. The Jules Ferry has made good progress at Cherbourg. The Jules Michelet and Victor Hugo, for the latter of which preparations had been made at Toulon, are to be built at Lorient. The Jules Michelet is 20 tons larger, has 1500 greater I.H.P. than the Victor Hugo class, and carries the same armament as the Ernest Renan. The estimated cost of the Jules Michelet is £1,183,800, including £203,000 for armament and torpedoes. Victor Hugo class.

The Ernest Renan (C 15), which was to have been begun last year, has been delayed owing to a modification of the plans, and will be laid down in 1903. The following particulars are taken from the Ernest Renan.

official programme of new construction*:—Displacement, 13,351 tons; length, 515 ft.; beam, 70½ ft.; draught, 26¾ ft.; I.H.P., 38,000; speed, 23 knots. The armament comprises two 9·4-in., twelve 6·4-in., and twenty-two 1·8-in. guns; whereas the Victor Hugo carries four 7·6-in. and sixteen 6·4-in. guns. The coal supply is to be 2300 tons, and will suffice for a range of 12,000 miles at 10 knots, and 2615 miles at full speed. The complement comprises 38 officers and 690 men. The Minister's idea has been to sacrifice something in the armament to increased speed—the addition of one knot. In his report on the Budget, M. Leygue said that great uncertainty attended the attainment of the desired speed, and deprecated the loss of homogeneity through the changes to be made in the type of cruisers.

The trials of the second-class cruiser Jurien de la Gravière, of 5685 tons displacement and 23 knots speed, were interrupted in July by an accident to her machinery.

Torpedo craft.

Considerable progress has been made in the building of destroyers and first-class torpedo boats. M. Normand has in hand, at Havre, the destroyers Arquebuse and Arbalète, shortly to begin their trials, and the Epieu, more advanced, with some torpedo boats. In the yard of the Forges et Chantiers de la Mediterranée, at the same port, the Catapulte, Bombarde, and some first-class boats are in hand. The Sagaïe, of 300 tons displacement and 28 knots speed, has arrived at Cherbourg for her trials. The Mousquet and Javeline, built at Nantes by the Ateliers et Chantiers de la Loire, are to be tried at Lorient, as well as the first-class boats 266, 267, and 268. The same company have still in hand at Nantes the Pistolet and Bélier and some torpedo boats, and have begun at Rouen the destroyers Dard and Baliste. At Rochefort, the Pertuisane and Escopette have completed their trials and are in commission; those of the Rapière have begun, the Flamberge has been launched, and the Sabre and Carabine are in hand. At the same port the Fronde and Harpon, built by the Chantiers de la Gironde, have arrived for trials. Several torpedo boats built by the Dyle and Bacalan Company, at Bordeaux, are also undergoing trials at Rochefort. The Creusot Company has increased the building facilities at Châlon-sur-Saône, and, in addition to torpedo boats, is building the destroyers Mousqueton and Arc. All the destroyers named above are from the designs of M. Normand. The destroyer Espingole foundered † after grounding off Cape Lardier in the Mediterranean. All on board were saved. Torpedo boat No. 225, which has been six years under construction at Mourillon, has been launched.

* État H.

† Efforts are being made to raise her.

M. Pelletan is a strong believer in the value of submarines. In the debate on February 6, already alluded to, he asserted that the best of French submarines gave but a slight idea of what the submarine ought to be. The submarine service has been organised, and there are at Cherbourg, under a commander, the submersibles Narval, Sirène, Triton, Espadon, and Silure, and the three submarines Morse, Français, and Algérien, forming a flotilla constantly engaged in exercises; at La Pallice, Rochefort, under a senior lieutenant, the Korrigan, Gnome, Lutin and Farfadet ; and at Toulon the Gustave Zédé and Gymnote. During 1903 the Naïde, Protée, Lynx and Ludion will be added at Cherbourg, the Loutre and Castor at La Pallice, and the Perle, Esturgeon, Bonite, Thon, Souffleur and Dorade at Toulon. Several submarines of the Naïade class are in hand at Cherbourg. Others of the same class are being built at Rochefort, where the submarines Gnome and Lutin are completing. At Toulon the submarines Grondin, Anguille, Alose, Truite, are in hand and two submersibles of the Laubeuf type, named Aigrette and Cigogne, have been begun. In relation to the large submersibles X, Y, and Z, designed respectively by MM. Romazotti, Bertin, and Maugas, it is announced that the first will displace 168 tons, and be provided with two screws to give a speed of 10½ knots; that the second will displace 213 tons, with a single screw for 11 knots; and that the third will displace 202 tons, with a single screw for 11 knots. Of the 19 submarines or submersibles to be put in hand in 1903, details of one only have been announced. It will be much larger than any of its predecessors, displacing 301 tons, 160 ft. long, and having a complement of two officers and eighteen men. There will be two torpedo tubes. Submarine craft.

The following are the vessels on the list for construction in 1903:— Programme 1903.

	To begin.		To continue.		To complete.		Total.
	Dockyards.	Private yards.	Dockyards.	Private yards.	Dockyards.	Private yards.	
Battleships	—	—	2	4	2	—	8
Armoured cruisers	—	1	6	—	5	4	16
Protected ,,	—	—	—	—	1	—	1
Destroyers	4	—	4	5	5	11	29
Torpedo boats	1	24	1	16	3	6	51
Submarines	19	—	13	—	13	—	45
	24	25	26	25	29	21	
	49		51		50		150

The Projet de Budget provides for 45,312 effectives in 1903, as compared with 48,252 in 1902. There is a reduction of 3585 in the *Personnel.*

number of men at sea, 265 in the numbers ashore, but an increase of 910 in the numbers in the Reserve.

An account of the works in progress at Bizerta was given in the Journal of the United Service Institution for January. These include the widening of the canal into the lake, and the construction of a dockyard, with dry docks, repairing shops, and coaling jetties at Sidi Abdallah. The two dry docks now in course of construction have a length of 656 ft.; one will be completed in about twelve months. The whole of the works are to be finished within three or four years.

Russia.

Programme and progress.

The whole of the work included in the Russian programme of 1898, which was to cover a period of seven years, is believed to be now in hand. The programme included eight battleships — the Pobieda, Cesarevitch, Retvizan, Alexander III., Kniaz Souvaroff, Borodino, and Orel, all in the water, and the Slava, not yet launched. It is reported that a new programme has been prepared, which includes five battleships of about 16,000 tons and three large armoured cruisers, and *Le Yacht* says that a battleship of the new type has already been laid down at Galerny Island.

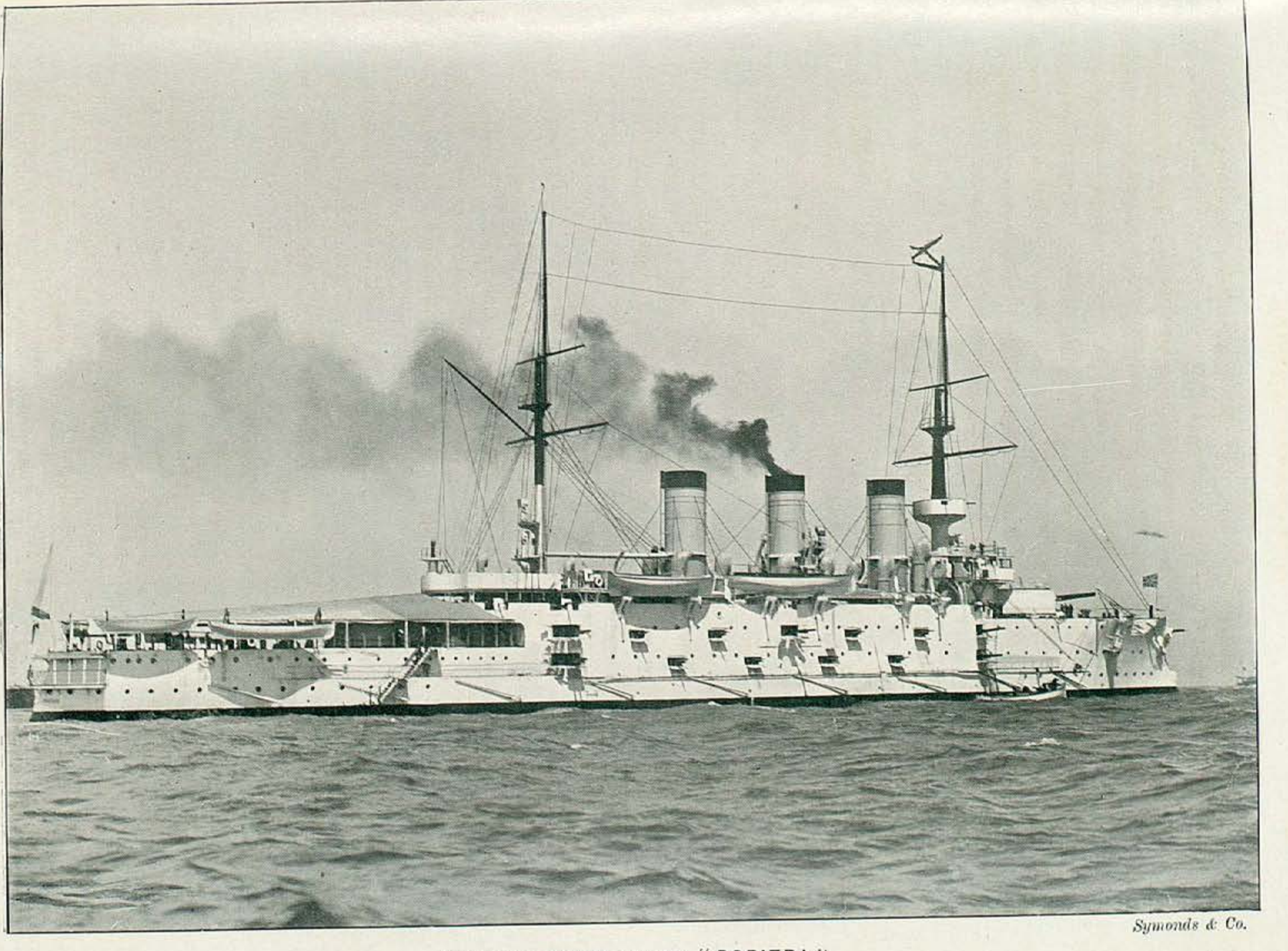
Battleships—completed Pobieda.

The Pobieda, of 12,674 tons displacement, represented the Russian Navy at Spithead. As will be seen from the illustration, she presents a huge target, far larger than any other ship at the review. Her side, like that of the Rurik and Rossia, bristles with guns, but of the total number of these only five are 6-in. guns. The Pobieda and Retvizan left for the East at the end of September, with cruisers and destroyers.

Completing. Kniaz Potemkin.

The Kniaz Potemkine Tavrichesky was begun in the Admiralty yards, Nikolaieff, on December 27, 1897, launched October 9, 1900, and steamed from Nikolaieff to Sevastopol in July, 1902, where she will be completed during the summer of 1903. The following particulars were given in the *Times*:—

She is fitted with Belleville boilers, the two groups aft being heated by coal, and the one group forward by petroleum. She carries 670 tons of coal, and of petroleum 580 tons, which together give her a radius of action of 3393 miles, at a speed of 9·3 knots. Her armour extends 237 ft. along the load-line on each side, with a thickness of 8 in. and 9 in., and is continued to the ends, fore and aft, with a thickness of 3 in.; at the lower casemates it is 6 in. thick, with a run of 156 ft. on each side, and at the upper casemates, or battery, for a length of 168 ft. on each side, the thickness is 5 in. The bulkheads at the terminations of the above-named armour are respectively 7 in., 6 in., and 5 in. in thickness. The lower steel deck is ⅝ in. thick, with armour-plates 1⅝ in. on the horizontal and 1⅞ in. on the sloping parts; it extends as far as the armour-belt. All the armour is of Krupp steel, made in Russia at the Izhorski Works. The upper armour deck has a thickness of 1½ in. The armament consists of four 12-in. Canet guns of 40 calibres, sixteen 6-in. Canet guns of 45 calibres, fourteen 2·95-in. Canet guns, six 1·85 Hotchkiss guns, six machine guns, two Baranovski landing guns, and five submerged torpedo tubes—one at the bows and four broadside.



Symonds & Co.

RUSSIAN BATTLESHIP "POBIEDA."

The Cesarevitch, built at La Seyne, has made her trials.

The Kniaz Souvaroff was launched at the Baltic yard, St. Petersburg, on September 25, in the presence of the Tsar and the King of Greece. Displacement, 13,516 tons; length, 367 ft. 5 in.; beam, 76 ft.; draught, 26 ft.; 16,000 I.H.P.; speed, 18 knots; Belleville boilers; coal capacity, 1250 tons. Armament: Four 12-in. guns and sixteen 6-in. guns in turrets. The Orel, laid down on June 2, 1900, was launched at the Galerny yard on July 19, 1902. The Slava will not be launched till the autumn of the current year. These ships are practically of the same type as the Borodino and Alexander III., which are completing afloat, and were described in the *Naval Annual* of 1902. According to various reports in the *Kronstadtski Viestnik*, they differ somewhat in regard to the secondary armament. Battleships launched.

The battleship Tchesmé, 10,181 tons, which was launched in 1886, is to be refitted. Refit.

The armoured cruiser Bayan, 7800 tons, built by the Forges et Chantiers de la Mediterranée, attained a speed of 22 knots for twelve hours on her trials in October, with 17,400 I.H.P. The armament comprises two 8-in. guns carried in closed turrets protected by 7-in. armour forward and aft, and eight 6-in. guns, of which four are mounted in a central redoubt and four in casemates. The armour on the water-line belt varies from 8 to 4 in. in thickness; that on the side above the belt, the redoubt, and casemates is 3 in. thick. Armoured cruiser. Bayan.

The Russian Navy has hitherto been extremely weak in cruisers. The few built, however, such as the Rurik and Rossia, were amongst the largest and most powerfully armed afloat, though from other points of view very weak ships. Vigorous steps are now being taken to remedy this deficiency, and Russia will shortly possess a goodly number of cruisers which in certain qualities are unsurpassed in any Navy. There are nine cruisers of the Askold type building or completing. Of three earlier ships of about the same size, the Aurora passed through her trials during the winter. The Diana and Pallada made their trials in 1901–2. These vessels are of 6630 tons displacement, and the speed is from 19 to 20 knots with about 12,000 I.H.P. Their successors have a speed of 23–24 knots with 24,000 I.H.P. on about the same displacement. Protected cruisers.

In 1898 competitive designs were asked for from certain firms. Messrs. Krupp, Cramp and Schichau, the Vulcan Company, the Howaldt and Nevsky yards competed. The design of the Vulcan Company was preferred, and the Russian Government has decided to build four sisters of the Bogatyr. Messrs. Krupp and Cramp followed the scheme outlined, and fitted shields to the 6-in. guns, but the Vulcan Company introduced modifications in the Bogatyr by

mounting four of these guns in two turrets, four in casemates and four only behind shields. The increased displacement of 6750 tons became necessary, but the speed of 23 knots was contracted for and attained. Messrs. Krupp, in the Askold, restricted to a smaller displacement, produced very satisfactory results in a cruiser excellently protected, and embodying some new ideas in the application of armour. Of the twelve 6-in. guns, five are for bow and five for stern fire, the guns having firing arcs of 270 degrees. Instead of the usual deck, with inclined engine hatches slightly raised, the Askold has a high armour glacis to the bases of her five funnels.

The particulars of the three types under construction are given below; those of the Bogatyr are from an excellent description in *Engineering* :—

	Askold.	Varyag.	Bogatyr.
Builder	Krupp	Cramp	Vulcan Co.
Length (p.p.)	426½ ft.	420 ft.	416¾ ft.
Extreme beam	49 ft.	52 ft.	54½ ft.
Mean draught	20¼ ft.	20 ft.	20¾ ft.
Displacement	6100	6500	6750
Armament	Twelve 6-in., twelve 3-in., eight 3-pdrs., and two 1-pdrs.		
Torpedo tubes	Two submerged and four above water.		
Armour—			
Deck, slopes	3 in.	3 in.	2 in.
Turrets (2)	nil	nil	5–3½ in.
Casemates (4)	4 in.	nil	3 in.
Conning tower	6 in.	6 in.	6 in.
Hoists	1½ in.	1½ in.	1½–2 in.
Funnel bases	1½ in. sloping	nil	2 in. vertical
Boilers	Schulz-Thornycroft	Niclausse	Normand Express
Screws	3	2	2
Coal (normal), tons	720	770	720
Coal (maximum), tons	1100	1250	1100

The following is the result of their trials:—The Askold, with a coal consumption of 1·87 lbs. and 20,390 I.H.P., steamed 23·4 knots for six hours, and on a second trial she attained a mean speed of 23·8 knots with 20,420 I.H.P. and a coal consumption of 1·82 lbs. The maximum was 24 knots with 23,600 I.H.P. The Bogatyr attained an average speed of 23·45 knots on her trials, the maximum speed, according to *Le Yacht*, being 24·15 knots with 20,250 I.H.P. The mean speed of the Varyag for 12 hours was 23·25 knots, and the maximum 24·6 knots. We have already called attention to the absence of the Thornycroft type of boiler in the British Navy. The Askold is fitted with nine Schulz-Thornycroft boilers. She was suddenly ordered to put to sea for her trials when only one boiler was in use. Within two hours she was steaming at the rate of 23 knots. This performance is remarkable. "It is certainly to be

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RUSSIAN CRUISER "ASKOLD."

deplored," says the *Engineer*, "that a prejudice against bent tubes should cut the record steam-raiser out of the competition."

Otchakoff.

The Otchakoff was launched at Sevastopol on October 4, 1902. Displacement, 6570 tons; I.H.P., 19,500; speed, 23 knots. A sister ship, the Kagul, is building at Nikolaieff. These ships were described on page 31 of the *Naval Annual* of 1902. Full particulars of the Otchakoff, as given in the *Kronstadtski Viestnik*, will be found in the tables. The Otchakoff will carry twelve 6-in. guns, four in turrets, four in casemates, and four with shields. The Oleg is building at the new Admiralty yard, St. Petersburg. Length, 434 ft.; beam, 54 ft. 6 in.; draught, 20 ft. 7 in.; displacement, 6570 tons. The Vitiaz, which was almost destroyed by fire at Galerny Island in November, 1900, when some 700 tons of material had been built into her, is understood to be making progress. Two other cruisers, of 17,000 I.H.P. and 20 knots speed, have been laid down at the Nevsky yard. They are to be fitted with Yarrow boilers.

Third-class cruisers.

The smaller cruisers of the Novik class were described last year. They should serve a useful purpose as "scouts." The Novik has been completed; the Boyarin (displacement, 3200 tons) is completing at Copenhagen; the Jemtchug and Izumrud (displacement, 3100 tons) are building at the Nevsky yard; the Almaz at the Baltic yard, St. Petersburg. The Boyarin is fitted with sixteen Belleville boilers, and on her trials attained a speed of 24·15 knots with 20,250 I.H.P. The Jemtchug and Izumrud are fitted with sixteen Yarrow boilers, and the estimated speed is 24 knots with, 17,000 I.H.P.; displacement, 3000 tons; length, 347 ft. 10 in.; beam. 41½ ft.; draught, 16 ft. The Almaz was laid down on May 6, 1902 The following particulars are quoted by the *Times* from the *Kronstadtski Viestnik*:—

The length of the Almaz over all will be 363 ft., and between perpendiculars 325 ft.; beam, 43½ ft.; draught forward, 14½, and aft, 17½ ft.; displacement, 2385 tons; engines, 17,500 H.P., supplied with steam by sixteen Belleville boilers; coal capacity, 560 tons; speed, 19 knots. She will carry 2·95-in. and 1·85-in. guns. She was laid down on May 6, 1902, and will probably be launched this spring.

The Ocean, intended as a training ship for stokers, has been completed at the Howaldt Yard, Kiel. Displacement, 11,897 tons.

Torpedo craft.

For some unexplained reason the names of a large number of Russian destroyers and torpedo boats have been changed during recent months, adding very greatly to the difficulty of preparing the lists. For example, the Sokol, built at Poplar, and the Kit, Skat, Delphin, and Kassatka, at Elbing, are now known as the Prytki, Bditelni, Bestrachni, Bespochtchadni, and Beschumi. New boats are frequently named, and it is often a matter of uncertainty whether they are the same as those built under other designations. It has

been suggested that this rearrangement of names has been adopted by the Russian Admiralty in order to conceal the actual number of boats added to the Fleet. It will therefore be understood that the list of Russian torpedo craft is subject to correction. It has been prepared by comparing the old list with statements in Russian papers and German and Austrian lists.

The destroyers Boiki and Bravi, of 350 tons displacement, have steamed 26 knots in their trials. The Bezumprechni was launched at St. Petersburg on June 14. Six destroyers have been laid down at Nikolaieff: displacement, 350 tons; speed, 26 knots. *Le Yacht* reports that 30 destroyers of 420 tons displacement are to be built. The torpedo boats Buistni, built at the Nevsky yard, and the Stremitelni, built by Creighton & Co., have attained mean speeds of 27·1 knots and 26·19 knots respectively on their trials. The Burni has steamed 26·1 knots and the Blestiaschy 26·6 knots. The Grozovoi and Vlastni, destroyers, of 28 knots speed, have been delivered at Kronstadt by the Forges et Chantiers de la Mediterranée, and have proceeded with the Boiki, Burni and four others to the Far East.

It is stated that several submarine boats have been built in the Black Sea.

The Far East.

A Russian squadron, under the command of Rear-Admiral Baron von Stackelberg, visited Portland in December. The squadron comprised the battleships Retvizan and Pobieda, and the second-class cruisers Pallada, Diana, and Bogatyr. It was on its way to the China station, from which the battleships Sissoi Veliki and Navarin, and the old armoured and protected cruisers Dmitri Donskoi, Vladimir Monomach, and Admiral Korniloff were last year withdrawn. Before being put off commission the Sissoi Veliky steamed 15·6 knots, the Navarin 15·8 knots, the Dmitri Donskoi 14·5 knots, and the Korniloff 17·5 knots. The Admiral Nachimof has also returned. At Port Arthur a stone basin for battleships has been built, with a 50-ton sheerlegs. Shipbuilding is in progress, and recently three destroyers were in hand there. The fortifications of the place are being extended. The fort at the entrance to the harbour has received four new 63-ton guns and seven Canet 5·5-in. Q.F. guns. The lines of forts on the adjacent coast extend 40 versts to the north and 12 versts to the south, surrounding the town, and in elevated situations.

The Black Sea.

The demand addressed to the Porte by the Russian Government that four destroyers should be allowed to pass from the Mediterranean to the Black Sea, and the consent given, have drawn new attention to the progress of Russian armaments in the latter, where Vice-Admiral Skrydloff has been appointed to the command. The

GERMAN BATTLESHIP "KAISER BARBAROSSA."

squadron, under Vice-Admiral Hildebrand, made a long cruise during the summer, and a report was prepared as to the facilities of Erzeroum and other ports on the coast of Asia Minor. A correspondent of the *Times*, writing from Kieff in September, drew attention to the arrangements made for the transport of troops in the ships of the Russian Steam Navigation Company, which he said were calculated to carry, upon a plan laid down, a force of 200,000 men. The *Times* correspondent at Odessa reported in January that six of the largest cruisers of the Volunteer Fleet—viz., the Orel, Moskva, Kherson, Smolensk, Peterburg, and Saratoff—which are capable of carrying over 10,000 troops, are to be kept in reserve in the Black Sea. The four first named have been idle for the greater part of 1902. Negotiations were in progress to place them on a foreign line, when a hitch occurred, possibly owing to Government pressure.

The Russian Minister of Marine has issued an order that all warships should be furnished with materials manufactured exclusively in Russia.

GERMANY.

Programme and progress.

It was explained in the *Annual* last year that the naval establishment proposed by the law of June 14, 1900, included 38 battleships, 14 large cruisers, and 38 small cruisers; also that the establishment of battleships actually ready or in hand (consisting of the four of the Sachsen class, the Oldenburg, four of the Brandenburg class, five of the Kaiser class, five of the Wittelsbach class, H, J, K, and L (1901–2), and eight ships of the Siegfried class (temporarily regarded as battleships), had reached 31.* To these must be added the battleships M and N, which are to be laid down in 1903. Battleships are to be replaced at the age of twenty-five years, and cruisers at twenty years. The building of relief battleships will begin in 1906, and 17 will be built by the final year of the programme in 1917. The building of relief cruisers (armoured) was begun in 1901 —the Ersatz Deutschland, to be laid down in 1903, being the third towards ten required—and of small cruisers in 1902. Twenty-nine of these last are required.

During the last year there were laid down the battleships K and L, the armoured cruiser Ersatz Kaiser, the small cruisers K, L, and Ersatz Zieten, the gunboat B, one river gunboat, and a division of torpedo boats. The vessels launched were the battleship Braunschweig, the armoured cruiser Friedrich Carl (Ersatz König Wilhelm), and the small third-class cruisers Arcona, Frauenlob,

* Of these only 18 were included by the German Emperor in his tabular comparison with the British Navy.

and Undine. There were completed the battleships Wittelsbach, Wettin, and Zähringen, the armoured cruiser Prinz Heinrich, the gunboat Panther, and some torpedo boats. The partial reconstruction of the battleships of the Brandenburg class (including reboilering) has been begun with the Wörth. Of the coast defence ships of the Siegfried class, which are being lengthened and improved, the Ægir and Siegfried are completed and others are in hand. In addition to the battleships and armoured cruisers named above, to be laid down in 1903, there will be two small cruisers as reliefs (Ersatzbauten).

Battleships completed.

The programme is thus being carried out with commendable regularity. There have been fewer delays in the German ships than in the French Navy or our own. Of the Wittelsbach class, the Wittelsbach herself (which was launched in 1900) and the Zähringen and Wettin are already in commission. The Wittelsbach and Wettin each attained a speed of 18 knots in their trials. The Wittelsbach went ashore in December, during a fog, on a shoal in the Great Belt, but was towed off. The plates of her hull were badly bent, but did not give way. The rudder was damaged, and the starboard screw rendered useless. The Mecklenburg is to be completed in March, 1903, and the Schwaben in November. The Kaiser Carl der Grosse has passed successfully through her trials. On the forced draught trial she is estimated to have realised 18 knots with 13,883 I.H.P. It is interesting to note that the Wettin was built in thirty-four months, and the Kaiser Barbarossa in thirty-five months, while the other ships of the class were built in from thirty-nine to forty-one months. The rate of construction in the German Navy now equals, if it does not surpass, that in our own.

Braunschweig.

Of the two new battleships laid down in 1901, the Braunschweig was launched at Kiel on December 20. J is being built by Messrs. Schichau, of Danzig. The displacement of these ships has been increased to 13,000 tons. The principal improvements over the Wittelsbach consists in the substitution of four 11-in. and fourteen 6·7-in. guns of a new model for four 9·4-in. and eighteen 6-in. guns. The armament is better distributed, ten 6·7-in. guns being carried in the main deck battery, which is protected by 6-in. armour, and four in turrets on the upper deck protected by 6·7-in. armour. This arrangement resembles the distribution of the secondary armament in the most recent British battleships. The great defect of the Wittelsbach armament—viz., the placing of two 6-in. guns immediately under the blast of the forward 9·4-in. guns—has been removed. The latter are no longer carried in an elevated barbette, but are mounted as in British ships. The area of armoured side has been largely increased; the belt is 9 in. thick amidships, tapering to

GERMAN BATTLESHIP "WETTIN."

4 in. at the extremities. The range of 6-in. armour over the central battery has been extended so as to form a complete redoubt from barbette to barbette. The armoured deck is 1½ in. thick on the flat, and 3 in. on the slopes. The main conning-tower is protected by 12-in. and the after one by 5½-in. armour. The weight of armour in the Braunschweig is about 4200 tons; the Braunschweig has three propellers, and the estimated speed with 16,000 I.H.P. is 18 knots; the normal coal supply is 700 tons, the maximum capacity being 1600 tons, besides 200 tons of oil fuel, or 350 tons more than the maximum capacity of the Wittelsbach class. The Braunschweig and J have six cylindrical and eight Thornycroft-Schulz boilers. It is, to say the least, remarkable that the Germans should employ in their most modern ships water-tube boilers of an English type which have not yet been ordered for large ships by the British Admiralty. Two battleships of the same type have been laid down—K at the Vulcan yard, Stettin; L at the Germania yard, Kiel. These ships are to be completed in 1905. M is to be laid down at Wilhelmshaven.

Armoured cruisers.

The armoured cruiser Prinz Heinrich, of 8905 tons displacement, on her natural draught trial attained a speed of 18·16 knots with 11,355 I.H.P., with a coal consumption of 1·94 lbs. On the forced draught trial she attained a speed of 20 knots with 15,703 I.H.P.

The armoured cruiser Prinz Friedrich Carl (Ersatz König Wilhelm), 9000 tons, was launched from the yard of Blohm & Voss, at Hamburg, on June 21. She is a sister ship to the Prinz Adalbert, which was fully described in the *Naval Annual* of last year. She is to be fitted, like the Prinz Adalbert, with 14 Dürr boilers. The estimated speed with 17,000 I.H.P. is 21 knots. A sister ship, Ersatz Kaiser, is under construction at Kiel. She will have some improvements owing to the additional displacement of 450 tons.

Third class cruisers.

The third-class cruiser Arcona (*ex* H), of 2672 tons displacement and 21·5 knots speed, was launched on May 3 at Bremen. The Undine (*ex* J) was launched on December 11 from the Howaldt yard at Kiel. These vessels mark a further advance on the Gazelle and Niobe classes, chiefly in their larger coal capacity (700 tons). The Frauenlob (*ex* G), which was launched in March last year, the Arcona, and Undine are to be completed in the spring of 1903. The Erstaz Zieten, K, and L, which are building respectively at Bremen, in the Vulcan yard at Stettin, and at the Government yard at Danzig, as well as the two small cruisers to be laid down this year, will be larger than their predecessors. Length, 361 ft.; beam, 40¼ ft.; draught, 16½ ft.; displacement, 3000 tons.

Reconstruction.

The changes to be made in the Brandenburg class include the removal of wood, improved ventilation, increased coal capacity, new

torpedo armament, and the addition of two 4·1-in. Q.F. guns. The cost of refits of these four ships is set down as £150,000.

Gunboats.

The gunboat B has been ordered at the Vulcan yard, Stettin. She is to be rather larger than the Panther, which is of 977 tons displacement.

Destroyers.

The new Schichau division of destroyers, S 114 to S 119, of 350 tons displacement, 6000 I.H.P., and 28 knots speed, will shortly be completed. The *Nord-Ostsee-Zeitung* published interesting particulars of the trials of destroyers built by the Krupp firm. These new destroyers, G 108 to G 113, have a contract speed of 26 knots. In shallow water No. 109 steamed at 27·87 knots, 112 at 27·73 knots, and 113 at 28·06 knots. G 108 and G 111 were tried in deep water, and their speeds were respectively 29·26 and 29·22 knots. All these speeds are the mean of runs of three hours. G 110 was delayed owing to parts of her machinery being exhibited at the Düsseldorf Exhibition. Torpedo boat No. 42 was run down in June off the mouth of the Elbe, the commander and five others being drowned.

Personnel.

Ueberall publishes the following figures in connection with the increase of the *personnel* of the German Navy:—In 1881 the total number was 11,352; in 1886, 14,682; 1891, 17,083; 1896, 21,835; 1901, 31,171; and when the naval programme of 1900 has been carried out the number will be 60,000. The number of executive officers has not increased in the same proportion, as in 1881 it was 458, and in 1901 924. On the other hand, the number of engineers has increased during the same period from 35 to 159; that of the warrant officers from 284 to 1280; and that of the petty officers from 1459 to 5558.

The Navy Estimates for 1903 amount to a sum of £4,669,818 for the ordinary charges, and £5,233,050 for the extraordinary charges, with £935,000 for the dockyards. The Budget Committee has rejected some of the demands, but the essential features of the shipbuilding programme will not be affected. Provision is made for the addition of one vice-admiral, five captains, eleven commanders, twenty-five lieutenants, 135 junior officers and cadets, twelve medical officers, and twenty-four engineers.

Italy.

Battleships.

The battleships Regina Margherita and Benedetto Brin, of 13,214 tons displacement and 19·5 knots speed, are completing at Spezia and Castellamare. The Regina Elena and the Vittorio Emanuele III., which are on the stocks, respectively, at the same ports, are of

12,425 tons displacement and 22 knots speed. It has been decided, as a result of the interesting comparative trials of the sister armoured cruisers, Garibaldi and Varese, fitted respectively with Niclausse and Belleville boilers, that the new battleships shall have the latter. Neither cruiser gave satisfactory results, and the decision of the Minister of Marine has caused some discussion. Two other battleships, the Roma and Napoli, are to be laid down at Spezia and Castellamare. Displacement, 12,625 tons; length, 435 ft.; beam, 73 ft.; mean draught, 24 ft. 4 in. The engines are to be of 20,000 I.H.P.; 1000 tons of coal and liquid fuel will be carried. The armament is to be the same as that of the Regina Elena.

New type.

The type was spoken of with strong approval in a paper read by Admiral Sir John Hopkins at the United Service Institution. It certainly presents some remarkable features, which have frequently characterised the battleships of the Italian Navy. The Regina Elena and her sister ships are to have the extraordinary speed of 22 knots. The armament is a powerful one, and comprises two 12-in. guns and twelve 8-in. guns, mounted in pairs in turrets of 6-in. armour. The substitution of 8-in. for 6-in. guns in the secondary armament may be fairly held to compensate for the reduction in the number of 12-in. guns. Though the armament is well distributed and fairly protected, in defensive qualities these ships are comparatively weak. The belt is 10 in. thick amidships, but the area of armoured side is far smaller than in most modern battleships. The coal supply is adequate. The Regina Elena and her sisters, like the Sardegna and Italia, belong rather to the class of armoured cruisers than to that of battleships. They are, in any case, most powerful ships. The battleship Italia is to receive new boilers.

Francesco Ferrucio.

The armoured cruiser Francesco Ferrucio, of 7294 tons displacement, was launched at Venice on April 23. She is of the same type as the Garibaldi and Varese, carries a very powerful armament, and is exceedingly well protected for her size. The estimated speed is 20 knots—somewhat low for a cruiser. The armament comprises one 10-in. gun, mounted in a barbette forward, and two 8-in. guns, mounted in a barbette aft. Ten 6-in. guns are mounted in the battery, and four on the upper deck behind shields. Protection is afforded by a complete water-line belt, 6 in. thick, from barbette to barbette, tapering to 3 in. at the ends. The side is protected, from the belt to the upper deck, by 6-in. armour, the ends of the battery being closed in by 5-in. bulkheads, which meet the walls of the barbettes. The coal supply is 650 tons, which may be increased to 1200 tons. The Francesco Ferrucio would be a formidable antagonist for even cruisers of twice her size.

The torpedo gunboat Coatit attained on her trials a speed of 21·1 knots with 8160 I.H.P.

The destroyer Turbine, of 325 tons displacement, on her forced-draught trials attained a speed of 30·16 knots with 5306 I.H.P. On the natural draught trials the speed was 25·2 knots with 3257 I.H.P. and a coal consumption of ·889 kilos. The Aquilone, sister ship to the Turbine and Nembo, and also built at Messrs. Pattison's yard, was launched at Naples on November 16. The complement will be five officers and forty-eight men. Two others of the class, the Zefiro and Espero, are in hand. A submersible with a speed of 14 knots on the surface and a radius of action of 2000 miles is reported by the *Times* to be building at Venice.

New programme. In the Budget of 1903–4, a sum of £829,629 is voted for shipbuilding, and it is intended to lay down two battleships, for which a further credit of £64,000 will be asked, four torpedo craft, a submarine, and two transports. The battleships A and B will be of the Vittorio Emmanuele type, and will be built at Spezia and Castellamare.

Personnel. The *Lega Navale* publishes the new law of promotion in the Italian Navy, together with the speech of the Minister of Marine explaining it, from which it appears that according to the law of 1858 the promotion from sub-lieutenant to lieutenant was two-thirds by seniority and one-third by selection during peace, and half by one and half by the other during war; that of lieutenant to captain of corvette, half and half in peace, and entirely by selection in war; while the promotion to all higher grades was in all cases by selection. The law of 1898 went to the extreme of doing away with selection for all grades save those above captain. The new law restores promotion by selection to the extent of one-fourth of those promoted to captain of corvette, and of one-third of those promoted to captain of frigate.

United States.

Personnel. The American Service papers published in November, 1902, reported that great discontent prevailed both amongst the officers and the men of the Navy; that suicides of officers had become common, and that there had been numerous desertions amongst the men. Owing to the lack of commissioned officers, those on duty had been seriously overworked, while the discontent on the lower deck is said to have been due to the curtailment of shore privileges.

Mr. Moody's report. Mr. Moody, the Secretary of the Navy, in his annual report, lays especial stress on the deficiency of officers.

"There is a present deficiency of 577, and 623 will be needed for

new ships and 160 to fill vacancies, making in all 1360 officers within the next four years. The only present source of supply is the Naval Academy, which in that period will furnish only 355. Appointments from civil life are universally condemned, and there can be but six promotions from the ranks annually. It is recommended that this number be increased to twelve. The shortage is not due to the employment of officers ashore, for, since January 1, the percentage of officers so employed fell from 26·8 per cent. to 18·6 per cent. The reduction was made against the wishes of some of the best officers of the fleet, and shore duty cannot be abolished entirely. The increase which is necessary should be in the ranks of lieutenant-commanders, lieutenants, and ensigns, since presently the superior ranks will be adequately supplied. The number of enlisted men in the service on June 30 was 21,433, of whom 8032 were landsmen for training and apprentices. The number authorised by law is 28,000, and up to November 15 the actual strength had been brought to 25,258; it is believed that by February next the authorised number will be completed. More men, however, are required, and the Secretary recommends that an addition of 3000 be authorised during the next financial year."

The report of Admiral Melville, the Chief of the Engineering Department, speaks quite as seriously of the state of the *personnel* of his branch. The recent regulations by which the line and engineering branches were amalgamated appear to have worked very unfavourably for the latter, and as a result not enough officers are found to undertake the engineering duties; therefore, he says, warrant officers, men of practical experience, but without theoretical training, have been obliged to assume responsibilities above their posts, until this has become a constant source of danger. In the Admiral's opinion, although the conditions are improving, the Navy is passing through a period of engineering inefficiency which is not only subjecting the nation to great expense, but inviting disaster. He recommends the establishment of an engineering laboratory at the naval school at Annapolis for the higher instruction of cadets and officers; that every engineering officer employed on shore duty should have a junior attached to his staff; that junior officers be placed in charge of all machinery in torpedo boats, destroyers, and auxiliary vessels; and that a general order be issued to the effect that junior officers of the executive branch should not be promoted until they have acquired a certain competence in the performance of engineering duties. Other of his recommendations have regard to the general demand for officers and the deficiency of graduates at the naval school. He proposes that a law be passed empowering the Secretary of the Navy to

Admiral Melville's report.

permit graduates of the technical schools to compete for commissions on the active list of the Navy. Already the system of selecting warrant officers for commissions has been put in force, but has proved inadequate. Indeed, it does not appear that since the law was passed there has ever been a sufficiency of applicants or a single instance of the full number of candidates qualifying for promotion. Rear-Admiral Melville also suggests in his report that the Department of Engineering should be placed in charge of all machinery of a distinctly engineering character.

Additions to be made.

These reports are of great interest, as showing the difficulties which the United States Navy has to overcome in meeting its manning requirements. The Secretary, for this and other reasons, did not propose to ask Congress for new ships, but the President's views, coinciding with a strong opinion expressed in Congress, caused a considerable provision to be made in the new Naval Appropriation Bill, of which particulars are given below. A considerable increase in the *personnel* is also authorised. It is intended to double the number of cadets at the Naval Academy for twelve years, to enlist 3000 more men for the Navy, and to add 550 men to the Marine Corps. There are to be thirty additional lieutenant-commanders (200 in all), fifty lieutenants (350 in all), and additions to the junior ranks as the new Act will provide, as well as many new officers for the civil branches. By these means it is hoped that existing difficulties will disappear.

Delays in construction.

The United States Navy, like many other navies—except that of Germany—has had to submit to considerable delays in the carrying out of its shipbuilding programme. The battleships are behind time from ten to twenty-nine months, the armoured cruisers from six to thirteen months, and the monitors from ten to nineteen months. Some ships have been delayed by the non-delivery of steel owing to strikes, others by the inability of contractors to supply armour, and of shipbuilders to procure a sufficient number of skilled artisans.

Admiral Bowles's report.

Rear-Admiral Bowles, the Chief Constructor of the United States Navy, in his report, points out that—

"Opportunity has been taken of the delay to revise the plans of the battleships. The superposed turrets in the Virginia class will have a continuous inclined front, smaller port openings, and motors removed from the rotating structure to the protective deck within the barbette. There will also be automatic shutters over the ammunition hoist apertures. The plan of ammunition stowage and supply has been rearranged and improved in connection with a scheme for placing splinter-proof bulkheads to isolate the 6-in. guns, and nickel steel on the ships' sides to protect the 3-in. guns. Particular arrange-

N. J. Quirk.

UNITED STATES BATTLESHIP "MAINE."

ments are to be made to facilitate coaling, including large hatches through which coal may be lowered in bags to the gun deck. The ventilation by means of electric fans will be much better than in existing ships."

In a paper read before the Institute of Naval Architects at New York, Admiral Bowles made the following interesting observations as regards the new types of battleships and cruisers recently authorised by Congress as compared with earlier types.

After pointing out that the cost of the Maine and Alabama classes was about six million dollars each, and that of the Connecticut seven million five hundred thousand dollars each, Rear-Admiral Bowles said: "The cost of four Connecticuts will equal the cost of five Maines and Alabamas. The weight devoted to battery and ammunition in the Maine and Alabama is 1003 tons, and in the Connecticut 1340 tons. Therefore, by increasing the displacement of the Maine and Alabama by 33 per cent., there has been a corresponding increase in the weight of armament carried. The weight of the discharge of one round from all the guns of the Maine and Alabama above 6-pdrs. is 5312 lbs., whereas the weight of the discharge of one round from all guns above 6-pdrs. on the Connecticut is 7856 lbs., or an increase of 47·9 per cent. Therefore, for an increase of one-third in size, there has been a gain of nearly one-half in effective battery power. Thus, if the battery power of the Maine and Alabama be considered unity, that of the Connecticut will be 1½; and for 30,000,000 dollars four Connecticuts can be built with a battery power of 6, and five Maines and Alabamas with a battery power of 5. In the case of the Maine and Alabama, the weight devoted to armour protection amounted to 2770 tons, and on the Connecticut to 3992 tons, thus showing an increase in protection of 44 per cent. for an increase in size of 33 per cent.

"The normal displacement of the Tennessee class is 14,500 tons —an increase of 6 per cent. over that of the Pennsylvania class of six vessels now building of 13,680 tons. Certain features of the new designs have permitted this increase to be almost wholly devoted to armament and armour, thereby producing, at slight additional cost, very much greater military power. The addition to the weight of guns and ammunition carried amounts to 29·7 per cent. over that on the Pennsylvania class, and produces an increase in the weight of one discharge of the battery amounting to 47·4 per cent. The increase in the weight of protection carried amounts to 30 per cent. of that on the Pennsylvania class, and is devoted to an increase in the armour on the turrets and the redoubts of the 10-in. guns, which

replace the 8-in. guns in the forward and after turrets on the Pennsylvania class, and to an increased area of side armour, affording ample protection to the magazines and the supply of ammunition to all guns, and also to a complete subdivision of the main battery by armour bulkheads. The estimated speed of the Tennessee class is 22 knots, the same as the designed speed of the nine cruisers now building of the Pennsylvania and St. Louis classes, and will be effected without an increase in machinery weights."

Admiral O'Neill.

The opinions of Admiral O'Neill, Chief of the Ordnance Bureau, have had some influence on the designs of the new battleships and cruisers. In his annual report he warns his readers against the prevailing "speed mania," which tends to make designers produce vessels of the highest possible speed quite irrespective of the purpose for which such vessels are constructed. The best battleship, he says, will be the one that can remain longest in the stress of action, not the one that can most quickly get into a fight or get out of it. In the main, his contention is that heavier armaments, more efficient protection, and larger magazines will give a better return, weight for weight, than the boilers and machinery needed to ensure what he considers excessive speed.

Ships completed.

During the last financial year the following vessels have been finally accepted: the battleships Alabama, Wisconsin, and Illinois; the torpedo boats Bailey, Bagley, Barney, Biddle, Shubrick, and Stockton. The torpedo boats Thornton and Wilkes, and the destroyers Decatur, Perry, and Preble, have been provisionally accepted. Between July 1, 1902, and November 1, 1902, the Thornton has been finally and the following vessels provisionally accepted; the monitor Arkansas, the torpedo boat destroyers Barry, Chauncey, Dale, Paul Jones, Truxton, Whipple, and Worden, and the torpedo boat De Long.

Trials.

The battleship Maine made an average speed of 18 knots on her trials with 17,000 I.H.P. The trial was made under service conditions, the mean draught being 23 ft. 6 in.

The monitor Nevada, built by the Bath Ironworks, made a speed of nearly 13 knots on her trials on December 18. She is of 3235 tons displacement. The contract price is 960,000 dollars.

Ships under construction.

The degree of completion of vessels under construction for the United States Navy, as shown by the official records of February 1st, is as follows: Battleships.—Missouri, 84 per cent.; Ohio, 69; Virginia, 18; Nebraska, 15; Georgia, 20; New Jersey, 26; Rhode Island, 26; Connecticut, 1; Louisiana, 1. Armoured cruisers.—Pennsylvania, 42; West Virginia, 44; California, 20; Colorado, 46; Maryland, 43; South Dakota, 22. Protected cruisers. Denver, 86;

Des Moines, 79; Chattanooga, 68; Galveston, 66; Tacoma, 64; Cleveland, 91; St. Louis, 14; Milwaukee, 10; Charleston, 27. Monitors.—Nevada, 99; Florida, 97. Torpedo Boat Destroyers. Hopkins, 95; Hull, 99; Lawrence, 99; MacDonough, 98. Torpedo Boats.—Stringham, 98; Goldsborough, 99; Blakely, 99; Nicholson, 98; O'Brien, 98; Tingey, 90. Submarine Torpedo Boats.—Plunger, 99; Grampus, 92; Pike, 88; Porpoise, 99; Shark, 98.

New battleships.

Congress has authorised the construction of the two battleships which were described last year. The Connecticut will be built at the New York Navy yard, and the Louisiana by the Newport News Shipbuilding Company. They are to be completed in forty-two months. In some respects the design has since been modified. The speed has been kept down to 18 knots with 16,500 I.H.P., instead of 19 knots and 20,000 I.H.P., as originally proposed. There will be eight 8-in. instead of 7-in. guns mounted in the turrets at the angles of the main deck. The following particulars as to the ammunition supply are taken from the *Engineer*:—

The ammunition and shell rooms are so arranged that about one-half the total supply will be carried at each end of the ship. The allowance is a very liberal one, amounting to nearly 600 tons. The ammunition for the 7-in. and smaller rapid-fire guns will be conveyed by hoists directly from the ammunition rooms or passages to the deck on which required, or as near that as possible. These hoists will be driven at a constant speed by an electric motor, and will be arranged to deliver seven pieces per hoist a minute. The 7-in. guns will have a hoist apiece. For the 8-in. there will be fourteen hoists, and for the 3-pdrs. and 1-pdrs. there will be combined hoists. To supply the 7-in. hoists there will be four ammunition conveyors, operated electrically, fitted in the passages and running directly from the handling rooms to the base of the hoists. These conveyors are really travelling sidewalks, and all the men have to do is to pass them from the door to the moving platform, and the platform delivers them wherever needed. This is an essentially novel feature, and will completely revolutionise the rate of delivery heretofore attained anywhere.

	Edward VII.	Connecticut.
Displacement	16,350	16,000
I.H.P.	18,000	16,500
Speed, knots.	18·5	18
Armament	4 12-in., 4 9·2-in., 10 6-in.	4 12-in., 8 8-in., 12 7-in., 20 3-in., etc.
Protection—		
Belt	9 in.	11·4 in.
Deck.	2·1 in.	5·1½ in.
Side	8 in.	6 in.
Main armament.	12 in.	12·8 in.
Secondary armament.	7 in.	7 in.
Coal at load draught	950	900

Washington, Tennessee

The two armoured cruisers of 14,500 tons displacement, of which some particulars were given in the *Naval Annual* of 1902, were authorised by Act of Congress on July 1, 1902, and have been named the Washington and Tennessee. The cost for hull and machinery, excluding armour and armament, is £970,630. The following

description is mainly from the *Engineer*, quoted from American naval papers :—

The four 10-in. guns will be mounted in pairs, in two electrically controlled balanced turrets on the main deck, one forward and one aft on the centre line, each gun having an arc of fire of 270 degrees. The turrets will have a general thickness of 8 in., with 9-in. port plates. The barbettes will be 7 in. thick, save where coming within the casemates, where they will be reduced to 4 in. The 6-in. guns will be mounted on the main and the gun decks. There will be four on the main deck, at each of the corners of the superstructure, protected by 5-in. armour. Those on the gun deck will be mounted in two broadside batteries of six each. They will be sheltered behind 5-in. armour, and be separated one from the other by splinter bulkheads of nickel steel 2½ in. thick. Their re-entering ports will permit the muzzles of the pieces to be housed within the side line of the armour-belt. These guns will have arcs of fire of 120 degrees; the forward and the after gun in each broadside being able to fire respectively dead ahead and dead astern. The 14-pdrs. will be mounted on the gun deck amidships and forward and aft, and on the main deck amidships in the superstructure. All of these guns, save those at the bow and the stern on the gun deck, which will be sheltered by 2-in. armour, will be housed behind 5 in. of hardened steel. Their arcs of fire will be wide. The 3-pdrs. will be mounted on the turrets and on the superstructure deck and bridges. The 1-pdrs. and machine guns will go in the military tops. There will be no torpedo equipment.

The hull will be protected by a complete water-line belt 7 ft. 6in. wide, having a maximum thickness of 6 in. for a distance of 260 ft. amidships between the barbettes of the 10-in. guns. Forward and aft of the heavy belt the water-line armour will continue to the bow and to the stern with a uniform thickness of 3 in. The casemate armour will extend from one barbette to the other, and from the water-line belt to the upper deck, being 5 in. in thickness, the gun positions on the gun deck being protected by this armour. The conning tower and its shield will be 9 in. thick, and the conning tower tube will be 5 in. thick. The signal tower, placed abaft the mainmast on the superstructure deck, will be 5 in. thick. Teak backing 3 in. thick will be fitted behind all armour. Behind the thin water-line armour cofferdams 3 ft. thick will be worked. These cofferdams will be filled with a water-excluding material. The protective deck will reach from bow to stern. It will be worked flat between the barbettes, sloping thence to the ship's ends. On the flat it will be 1½ in. thick; on the sides of the slope 4 in. thick and 3 in. forward and abaft.

The 10-in. guns will be provided with the usual electric power hoists direct from the handling rooms. In order to provide an efficient supply of ammunition to the 6-in. guns, a central passage has been arranged below the protective deck, extending from the forward to the after magazines, the main supply of ammunition for the 6-in. guns being through this passage, from which lead the power hoists which deliver the ammunition to the guns. There will be a travelling platform in this passage to facilitate this work. The ammunition for the 3-in. 3-pdr. and other small guns will be conveyed by hoists from the handling rooms of the magazines to the protective deck, where it will be transferred to the hoists leading directly to the gun stations.

The propelling machinery will consist of two main engines, each in a separate water-tight compartment, and of sixteen water-tube boilers in eight water-tight compartments. The main engines will be of the four-cylinder triple-expansion type. The engines will make 120 revolutions when developing 25,000 I.H.P. Forced draught will be on the closed ashpit plan, with a pressure of not more than an inch of water.

The coaling arrangements, which will be similar to those for the battleships Connecticut and Louisiana, will permit of coaling simultaneously from four barges—two on each broadside.

Protected cruisers.

The Denver, of 3400 tons displacement, was launched in June, the Des Moines in September, 1902, and the Galveston at Richmond in January, 1903. Three other vessels of the same type are under construction. The speed is 16½ knots with 4700 I.H.P.

The Philadelphia has been converted into a school-ship. The Baltimore, Newark, Albany, and New Orleans are to be rearmed, the

two former with new model 6-in. guns, the two latter with 5-in. guns in place of the 4·7-in. Armstrong guns they now carry.

Five small gunboats are under construction by the Usaga Dock Company in Japan for service in the Philippine Islands. The first of the class was launched in December, 1902.

Two gunboats, the Dubuque and Paducah, of 1085 tons displacement are to be built by contract: armament, six 4-in., four 6-pdr., two 1-pdr., two colt guns; speed, 12 knots with 1000 I.H.P.; coal capacity 200 tons.

Destroyers.

The destroyer Stewart, built by the Gas Engine and Power Company, Morris Heights, New York, has attained a speed of 29·3 knots on her endurance trial. The contract speed was 27 knots. The Goldsborough, built by Wolff, Saiker & Co., of Portland, Oregon, has again broken down on her trials. She is to have new machinery. The Hopkins and Hull, of 408 tons displacement, were launched in June by Messrs. Halan & Hollingsworth. The estimated speed is 29 knots with 8000 I.H.P.

Submarines.

The trials of the submarine boats Adder and Mocassin were conducted in smooth land-locked waters, and are considered by the Board of Inspection not to have fully tested their capacity. The Adder maintained a mean speed of 8·78 knots for three hours on the surface, and 6·88 knots for the same time when submerged. Two attempts to hit a fixed mark with the torpedo failed. The men are said to have suffered much discomfort from want of air. The Adder and Mocassin, as well as the Porpoise, Pike, Shark, Plunger, and Grampus, belong to the Holland type.

The Protector has been built by the Lake Torpedo Boat Company, of New York, and belongs to the Lake type, so-called after its inventor. The leading features of the two types may be compared as follows:—

	Protector.	Holland Type.
Length over all	65 ft.	63 ft. 4 in.
Beam	11 ft.	11 ft. 9 in.
Displacement afloat	115 tons	105 tons
Surface buoyancy	55 tons	15 tons
H.P. of engine	250	160
H.P. of batteries for 4 hours	75	70
Propellers	2	1
Torpedo tubes	3	1
Fuel capacity, galls.	1400	850
Speed	10 to 11 knots	8 knots

Both boats have an estimated submerged speed of 7 knots, and the strength of hull in both cases will permit them to be submerged to the depth of 150 ft. The Protector differs from the Holland in that it has three methods of submerging instead of two, and four methods of coming to the surface instead of three; that it submerges

on a level keel instead of diving by the bow, at varying angles; that it travels along the bottom on wheels; that it possesses a diving compartment which enables the crew to leave the boat when under water. The following extracts from an article by a naval correspondent of the *Westminster Gazette* will be of interest:—

The first operation—viz., the admission of water ballast to bring the vessel to the "awash" condition, is common to both. The Holland is steered below at an angle by the horizontal rudders at the stern, whilst the Lake is submerged on an even keel by the manipulation of six "hydroplanes" or horizontal rudders, three of which are carried on each side. This is the method of submersion when under way. When stationary, however, another method is employed. Two heavy weights are lowered to the bottom, each weighing 1000 lbs. The winding mechanism is put into operation, and the boat is hauled down to the bottom.

The bottom reached, the submarine rests on the two wheels which she carries, and then runs along the ocean floor just as a carriage rolls along a road. The vessel thus becomes in reality a "submarine automobile." The weights are hauled in, and enough water ballast is admitted to keep her from rising to the surface. The wheels are 3 ft. in diameter, with 9-in. face, and are constructed of cast iron.

An automatic drop keel is carried, and there are other automatic features to prevent the craft submerging below a safe depth.

There are ample officers' and crews' quarters, with cooking and sleeping facilities, and there is provision for the escape of the crew in case of partial disablement of the vessel while submerged.

A great feature of the "Lake" boat is the diving compartment, located in the bow of the boat. It is a room about 8 feet long with a door that opens outward into the sea. An air-lock connects the diving compartment with the living quarters when the captain desires to send a man out. He enters this compartment, closes the door, and opens a valve which admits the compressed air until the pressure of the air in the diving compartment equals the pressure of the water at whatever depth the boat happens to be. There is a duplex gauge in the compartment with a red and a black hand. The black hand shows the water pressure outside, and the red hand shows the pressure of air inside the diving compartment. When the two hands are together this indicates that the pressure of the water outside and the air pressure inside are equal. Then the door can be opened, and the water will not come in. The diver who leaves the boat can pick up and cut cables and can do mining and countermining work. The "Holland" boats, it may be added, are not provided with diving compartments.

New programme.

The Naval Appropriation Bill, which has just passed Congress, provided originally for the construction of three first-class battleships carrying the heaviest armour and most powerful ordnance for vessels of their class, of not more than 16,000 tons displacement, to have the highest practicable speed and great radius of action, and to cost not more than 4,212,000 dollars each, and one armoured cruiser of not more than 14,500 tons displacement, to cost 4,659,000 dollars, exclusive in both cases of armour and armament; two steel sailing training ships and a wooden brig; and for the expenditure of 500,000 dollars on experiments with submarines. The Senate, acting on the opinion of Admiral Dewey and Captain Mahan, proposed to substitute battleships of 12,000 tons in larger number, in lieu of those proposed of 16,000 tons. To this change the House of Representatives was opposed, and its committee was supported by the President and by the unanimous opinion of Admirals Melville, Bradford, O'Neill and Bowles. The latter presented a report in which he contended that smaller battleships would be inferior in armament, speed and range,

and that number does not compensate for loss of quality. The Senate subsequently modified its proposal, and the Naval Appropriation Act now includes three battleships of 16,000 and two of 13,000 tons, but no cruisers.

JAPAN.

Programme.

The programme of construction for the Japanese Navy, from 1904 to 1909, includes four battleships and six cruisers, besides destroyers and torpedo boats. The annual expenditure involved is above £2,000,000. In relation to this new programme, and to the alliance with Great Britain, the *Times* correspondent in Tokio, writing on October 10, 1902, gave some interesting particulars :—

It must be understood that very few voices were raised in endorsement of that view [that naval construction should be deferred]. The general conviction was that the alliance, so far from justifying any relaxation of Japan's efforts, imposed upon her the responsibility of more strenuous exertions than ever, both on sea and on shore, since if she hoped for the continuance of a union so essential to the preservation of peace in the East she must qualify herself to be always counted a valuable ally. There never was, indeed, the slightest chance of the other theory's obtaining public endorsement; it could not find any echo in the heart of a nation so profoundly patriotic as are the Japanese. Very soon, therefore, these feeble suggestions ceased to be audible, and publicists directed their attention entirely to considering, first, what standard should be taken for determining the dimensions of the projected augmentation; and, secondly, from what sources the necessary funds might be obtained. As to the former point, a marked consensus of opinion quickly declared itself; Japan, it was affirmed, must have a Navy equal to the combined Eastern squadrons of any two European Powers—England excepted, of course—and obviously the French and Russian squadrons, being the strongest after the British, were the ones to be considered in that context. The total displacement of Japan's Navy at present is 259,593 tons; but, when fullest allowances are made for old or partially obsolete vessels, it is calculated that of first-class fighting material she could not put into the battle line more than 180,000 tons. Now the Russian squadron represents 157,000 tons and the French 57,000, the two aggregating 214,000 tons. Corrections must be applied, of course, especially in the case of the Russian squadron. After they have been applied, it results that the advantage as to tonnage and fighting capacity generally is with the Japanese fleet. But Russia and France are not idle. According to their present programme they will have from 350,000 to 360,000 tons of shipping in the Far East in 1907, or some 300,000 tons of vessels fit for the line of battle. Japan, therefore, must add 120,000 tons to her fleet during the next six years, and that is just what her statesmen contemplate, the details being four battleships, to be built in England, six first-class cruisers, to be built in England, Germany, and France, and certain minor craft to be built at home. Of course, it will be understood that no official announcement of such a programme has yet been made. The Diet will be the first to receive the declaration. But the facts may be regarded as tolerably well assured.

The Estimates for 1903–4 amount to £2,885,000, of which £2,385,000 represents ordinary expenditure and £500,000 extraordinary expenditure.

Launches and trials.

The cruiser Niitaka, built at Yokosuka from the plans of Mr. Satow, has been launched. Displacement, 3420 tons; length, 235½ ft.; beam, 44 ft.; draught, 16½ ft.; armament, six 6-in., ten 3-in., and four 2½-pdr. guns; 10,000 I.H.P., with Niclausse boilers; speed, 20 knots. At the same yard the 380-ton 30-knot destroyers

Harusame and Muvasame and two 89-ton torpedo boats (Nos. 67 and 68) have been launched.

The destroyer Asashio, built by Messrs. Thornycroft & Co., attained a mean speed for three hours of 31·058 knots, with 381 revolutions and 7224 I.H.P.

At Yokosuka a 3000-ton cruiser, the Otawa, is in hand, and at Kure the Tsushima (a sister of the Niitaka) and the gunboat Niji (620 tons).

The Idzumi (ex Esmeralda), 2750 tons, has been reconstructed in Japan, receiving part of new armament, as given in the tables, and new boilers. She steamed at 17·4 knots on her trials.

Argentine Republic.

The Rivadavia was launched from the yard of Messrs. Ansaldo, at Sestri Ponente, on October 22, 1902, and the Moreno at the same yard on February 9, 1903. They are armoured cruisers of an improved and enlarged Garibaldi type, 7700 tons displacement, intended to steam at 20 knots with 13,500 I.H.P. The belt, citadel turrets, and bulkheads are of 6-in. Harvey nickel steel. The Moreno will carry four 8-in., fourteen 6-in., and eighteen smaller guns; the Rivadavia, one 10-in. gun and two 8-in. guns, with the same smaller armament. Owing to the convention between Argentine and Chili providing for some measure of disarmament, a certain doubt exists as to the ultimate ownership of these vessels. The writer saw these vessels in February. The Rivadavia had her armour fixed in position. The Moreno had not. Work on both appeared to be at a standstill.

Austria-Hungary.

The ordinary estimates amount to £1,451,206, and the extraordinary estimates to £588,000, a total of £2,039,000, being an increase of £90,000 on the estimates for the previous year. The Budget includes the last instalment for the completion of the cruiser Szigetvar, 2350 tons, and the coast defence battleship Habsburg, of 8340 tons.

The Habsburg has already concluded her trials, the conditions of which were that a mean power of 11,900 I.H.P. should be maintained, and a mean speed of 18½ knots. On a carefully measured course of 68 knots she attained a mean speed of 19·64 knots with 14,942 I.H.P. She is fitted with sixteen Belleville boilers. The Babenberg, sister ship to the Hapsburg, was launched on October 4 at

AUSTRIAN BATTLESHIP "HABSBURG."

Trieste. The Arpad is the third vessel of this class. She was launched in 1901, and is now approaching completion. The fourth and fifth instalments for these vessels, respectively, are included in the Budget of 1903. These ships have already been described in the *Naval Annual* for 1901. They are fairly well protected, but the main armament comprises only three 9·4-in. guns. The secondary armament includes twelve 5·9-in. guns, and is as powerful as that of battleships nearly twice their size. There is a belt of 8½-in. Krupp steel, 8 ft. wide and 223 ft. long amidships, with a 2½-in. deck, and terminated by 8-in. bulkheads, from the lower edges of which the protective deck extends fore and aft. The bow is reinforced with 2-in. plating 8 ft. high, of which 3½ ft. is above the water. Above the belt is side armour, also 223 ft. long and 7½ ft. high. It has a thickness of 4 in. only, save at the ends, where the flat bulkheads are 8 in. thick. A 1-in. steel main deck covers this redoubt. On it stand the casemates in double storey, 5 in. on the fronts, 3 in. at the backs. The forward and after conning-towers have respectively 8-in. and 4-in. armour, with 6-in. communication tubes to each. The turrets stand on 7-in. circular towers, which contain all the machinery. These turn in low barbettes on the deck. The fore turret carries two and the after one one 9·4-in. of 40 calibres. The 5·9-in. guns are also of 40 calibres. The big guns are electrically controlled, and electric hoists and ventilators are fitted throughout the ship. The hoists to the 6-in. guns can supply eight rounds per minute. The total weight of armour is 2250 tons. The speed is very good; the coal supply is, of course, small—500 tons normal, 840 tons maximum; the latter sufficient for a distance of 3700 miles at 10 knots.

The battleships A and B, of 10,600 tons displacement, and the cruiser E, of 7300 tons, were described in the *Naval Annual* of 1902. For the battleships the second and third instalments, and for the cruiser the fourth instalment, are included in the estimates of 1903.

A second instalment of £31,250, for two monitors and five patrol boats for the Danube, which were begun last year, is also taken in the estimates. **Danube monitors.**

A Bill has been presented to the Austrian Parliament for the increase of the *personnel* of the Navy from 7500 to 10,500 men. For this purpose the annual naval contingent will be increased from 1875 to 2625 men, beginning with 1903, so that the full contemplated increase in the *personnel* will not be reached until 1906. The additional men are required for the new ships which are building, particularly those of the Habsburg type. The period of service for the men in the Austrian Navy is four years. ***Personnel.***

New dock at Pola.

A large floating dock with a lifting power of 15,000 tons is approaching completion at Pola. The docking facilities of the port were inadequate for the battleships now in hand, and it was decided to construct a floating dock of sufficient size. The work has been undertaken by an English firm.

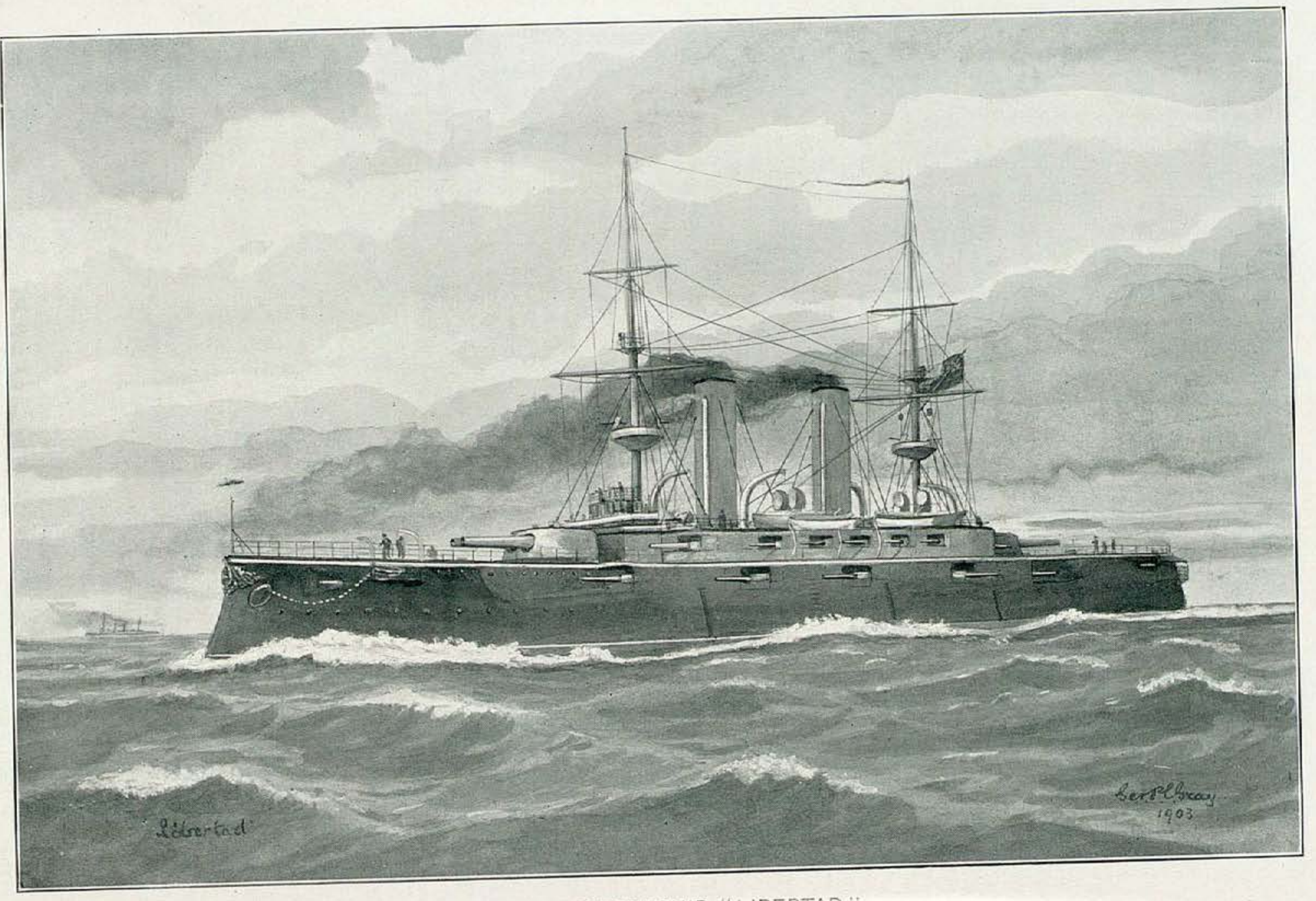
Chili.

The two battleships Constitucion and Libertad were launched respectively at Elswick and Barrow on January 13 and 15, 1903. They are practically identical in all respects. The following are the principal particulars:—Length between perpendiculars, 436 ft.; breadth, 71 ft.; draught, 24 ft. 6 in.; displacement, 11,800 tons.

The armament comprises: Four 10-in. guns, mounted in pairs in barbettes fore and aft; fourteen 7·5-in. Q.F. guns, ten of which are mounted in the citadel and four in casemates on the upper deck; fourteen 14-pdr. Q.F. guns; four 6-pdr. Q.F. guns; four pom-poms; four Maxims; two 12-pdr. field guns. There are two submerged torpedo tubes.

Each ship can fire a total weight of 13½ tons of projectiles in a minute, with a collective energy of 1,700,000 foot-tons, as against the 9 tons and 1,000,000 foot-tons of the Russell class of the British Navy. Of protective armour they carry a K.C. belt 7 in. in thickness amidships from barbette to barbette and from 5 ft. below the water-line to the upper deck, but only 3 in. thick fore and aft of the barbettes. The bases of the latter are protected by 10-in., the barbettes by 8-in., K.C. armour. The ten 7·5-in. guns on the main deck, besides being protected by the 7-in. side armour, are separated from each other by armoured screens both longitudinally and transversely. Further protection to these guns is afforded by the upper deck being 1 in. thick within the citadel. The casemates for the upper deck guns are 7 in. thick in front and 3 in. in rear. The protective deck is 3 in. thick on the flat and slopes outside the citadel, and 1½ in. thick inside the citadel. The armour on the conning-tower is 11 in. thick.

The two sets of triple-expansion engines, which are being constructed by Humphreys, Tennant & Co., are expected to develop 12,500 I.H.P., and to secure a sea speed of 19 knots. Steam is supplied by twelve boilers of the Yarrow large-tube type, which are arranged in four stokeholds, each of which forms a separate watertight compartment with its own complement of fans, ash-ejectors, ash-hoists, etc. The coal supply at load draught is 800 tons, and the maximum capacity 2200 tons, sufficient to carry the ship for 12,000 sea miles at a speed of 10 knots. The complement is 770.



CHILIAN BATTLESHIP "LIBERTAD."

The Constitucion and Libertad were ordered in February, 1902, one of the conditions of the contract being that they were to be completed in eighteen months. The convention concluded between the Argentine Republic and Chili has permitted this condition to be relaxed. Under the same convention they are to be sold to some other Power. It has been decided not to secure them for the British Navy, to which they would have been valuable additions.

The *Engineer* draws an interesting comparison between the Constitucion and Libertad and the leading battleship types completing or recently commissioned in other Navies :—

The most remarkable feature of the list is the variation of the indicated horse-power. Mostly it is due to lines. These can only be guessed at from the available figures, save in so far as a likeness between those of the Vittorio Emanuele and Constitucion is to be suspected. Certainly it is interesting to note that, while but 12,500 indicated horse-power is needed to drive the Constitucion at 19 knots, the Suffren requires 16,200 for but 18 knots—a speed that the Russian ship, of apparently clumsier form, is to reach with only 10,600 indicated horse-power. Both these last, by the way, have on their early trials just scraped through at 18 knots. The Maine, with her 16,000, did little more than pass the 18-knot standard, which the Wittelsbach just managed with her 14,000. The four 18-knot ships, then, have been tried, and their allotted indicated horse-power has provided what was demanded in each case without appreciable excess. One sees, therefore, how great a part lines play in modern design.

Let us now carry the comparison into other channels. Commuting the values of the shell fires to 12-pdr. units on the system that we have used on previous occasions, the broadsides work out as follows:—(1) Constitucion, 81·4 units; (2) Wittelsbach, 75 units; (3) K. P. Tavritchesky, 72 units; (4) Maine, 71 units; (5) Vittorio Emanuele, 61 units; (6) Suffren, 59 units; which justifies the builders' contention that the Constitucion is the best gunned ship of her size afloat.

In armour protection it is difficult to arrange the ships in order of value. It is easy to note which is best in any particular spot; the trouble is to assign a ratio between these spots. Roughly one might assume—and expect to find—that protection is in inverse ratio to gun-fire. In water-line protection we can safely place the ships as follows:—(1) Suffren; (2) Maine; (3) Vittorio Emanuele; (4) Wittelsbach; (5) K. P. Tavritchesky; (6) Constitucion. But, when we come to protection of the secondary armament, there is a change at once. This order, taking into consideration distance between guns, nature of the system, base protection, and so forth, we incline to place as follows:—(1) Constitucion; (2) Maine; (3) Wittelsbach; (4) Vittorio Emanuele; (5) K. P. Tavritchesky; (6) Suffren; but the difference is very little.

As regards protection to big guns, it is not yet clear to us exactly on what system some of the big guns are being mounted, so a list cannot be given. But, roughly, what any one of these ships loses in the five qualities of armour, armament, speed, coal endurance, and handiness, she gains in some other. All six are excellent ships, and it is not very easy to choose between them on paper.

The point of interest is that they compare very well with much larger ships, though, seeing they do so well on paper, in actual fact they should be less seaworthy or stout; but this is rather a matter of surmise than certainty.

To return to the Constitucion. Her salient feature is, of course, the battery of 7·5's instead of 6-in. We do not believe much in the 7·5—that is to say, we had far sooner have two 6-in. than one 7·5-in. But when a battery of them as numerous as the usual 6-in. battery is given, there can be little question of the gain gun for gun. Twenty-eight 6-in. might have been better, but in a ship of 11,800 tons it would hardly be possible to mount them without a fatal crowding. The alternative battery would have been that of the Wittelsbach or Kniaz Potemkin Tavritchesky. It is doubtful whether any of these would have been better. War may prove otherwise, but the odds are against it. The superior penetration of the 7·5 may be discounted in nine cases out of ten, so may that of the 12-in. over the 10-in. At times the extra penetration may tell, but not often. When it comes to shell-fire there is little doubt that the 7·5 shell, combined with 10-in., will be better than the combination of 6-in. and 12-in.

CHINA.

The cruiser Kai-Chih, of 2110 tons displacement, was blown up by an explosion of her own powder magazine at Nanking in June, 1902. A large proportion of her crew were drowned. Two third-class cruisers, the Kien-Wei and Kien Gnan, have been completed at Foochow.

COLUMBIA.

The Columbian Government has bought the small cruiser El Bashir, of 1200 tons displacement, the sole representative of the Navy of Morocco. She has been renamed Almirante Lezo.

HAYTI.

The Haytian gun-vessel Crête-à-Pierrot, of 940 tons displacement, was destroyed at the entrance to the roadstead of Gonaives on September 7 by the German gunboat Panther in punishment for the seizure, by Captain Killick, of that vessel, of the German merchant ship Markomannia, laden with munitions of war for the provisional government of Hayti. The Government at Berlin published the following official report of the affair:—"Captain Eckermann, of the Panther, had received orders to capture the piratical gunboat Crête-à-Pierrot. The Panther went, therefore, from Port-au-Prince to Gonaives, where it surprised the Crête-à-Pierrot. The German commandant sent the following ultimatum:—'Strike your colours within fifteen minutes and disembark from your ship without undertaking any defensive measures whatever; otherwise an immediate attack will follow.' The Panther had already cleared for action. The Crête-à-Pierrot hauled down her flag within the allotted time and the crew disembarked. The Panther then intended to take the Crête-à-Pierrot in tow, but an explosion of her after powder magazine occurred, which was evidently effected by the Crête-à-Pierrot's crew. The explosion destroyed her stern and set the vessel on fire, rendering taking her in tow impossible, especially as further explosions followed. As this was regarded as a hostile act, and as the forward guns were still in condition, the Panther's captain caused the forward magazine to be exploded by gun fire. After this was exploded the Crête-à-Pierrot broke up and sank. The admiral was on board with the rebels." The German Foreign Office stated that the Haytian provisional government communicated to Germany that Hayti regarded the Firminist gunboat Crête-à-Pierrot as a pirate, and that the interests of Hayti were untouched by the action of the Panther.

Mexico.

The gun-vessels Tampico and Vera Cruz (980 tons) were launched at the Crescent shipyard, Elizabethport, New Jersey, on September 15. Speed, 16 knots. Armament, four 4-in. and four 1-pdr. guns. Four destroyers are said to have been ordered from Messrs. Ansaldo.

Netherlands.

The Naval Budget for 1903 amounts to £1,376,068, including £32,161 for administration, £555,961 for material and shipbuilding, and 388,829 for *personnel*. Four torpedo boats of the Ophir class are to be built.

The torpedo boats Minotaurus and Python were launched at Flushing on September 18.

The majority of the Commission on submarine boats decided to recommend the purchase of one of the Holland type.

Norway.

The Naval Budget for 1902-3 amounts to £251,700, and includes charges for the building of two second-class torpedo boats and a submarine boat.

Portugal.

The old ironclad Vasco da Gama, of 2422 tons displacement, built at Blackwall by the Thames Ironworks Co. in 1876, is being reconstructed by Orlando, of Leghorn. Her length will be increased to 233 ft., and her displacement to 3020 tons. Her speed is expected to be 15·5 knots with 6000 I.H.P. under forced draught. The armament will include two 8-in. Q.F. guns in 8-in. barbettes of Krupp steel, four 4·7-in. guns—one forward, one aft, and one on each broadside—two 70-mm., two 25-mm., and four machine guns. She will be fitted with two submerged torpedo tubes. The side armour remains as before. Coal supply is 300 tons. These particulars are from the *Mittheilungen aus dem Gebiete des Seewesens.*

The gunboat Patria, of 630 tons displacement and 15 knots speed, is under construction. Armament four 4-in. and six 1·8-in. guns. Some river gunboats have been laid down.

Spain.

A committee has reported in favour of the construction of ten or twelve battleships, six to ten cruisers, besides a number of smaller craft, for the Spanish Navy, and Señor Sanchez Toca, Minister of Marine, has proposed the addition of one million sterling to the next Navy Estimates for the commencement of the construction of the new fleet. He will make a Cabinet question of certain items, amounting to about £400,000. The execution of the whole programme would involve an outlay of from 20 to 24 millions sterling.

The armoured cruiser Cardenal Cisneros, which was launched in 1896 at Ferrol, has at last passed through her trials. On the trial at four-fifths power, with natural draught, the speed was 18·4 knots with 11,000 I.H.P., and on the forced draught trial 20·7 knots with 15,000 I.H.P.

The torpedo gunboat Doña Maria de Molina, of 830 tons displacement and 20 knots speed, has been commissioned.

The protected cruiser Extremadura, of 2030 tons displacement, 7000 I.H.P., and 20 knots speed, has passed through her trials.

The *Diario de Barcelona* states that the cruiser Marquès de la Enseñada has been struck off the list of the Spanish Navy. She was built at Carraca in 1890. The cruiser Alfonso XIII., constructed at Ferrol in 1901, does not any longer appear in the list of the Spanish Navy.

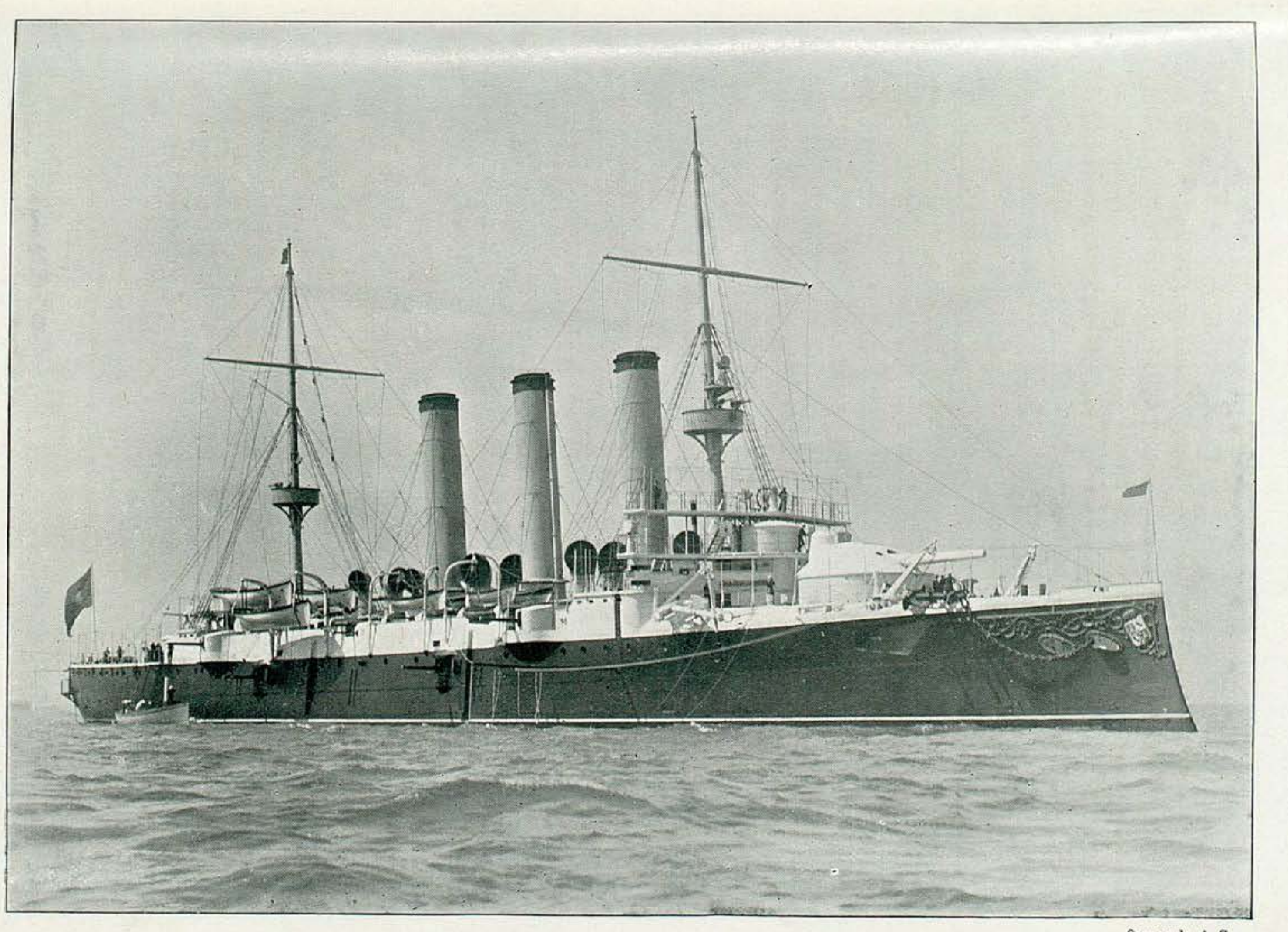
Sweden.

The programme for the increase of the Swedish Navy is proceeding. The Naval Budget for 1903 amounts to £652,625 for the ordinary and £430,050 for the extraordinary charges, being an increase of £77,216 on the former and a decrease of £174,018 on the latter. Provision is made for adding 11 officers, 28 non-commissioned officers, and 275 men and boys. In the extraordinary charges is a sum of £280,178 for the second and final instalments for the coast-defence battleship Manligheten, and for three first-class and two second-class torpedo boats, and also the first instalments for an armoured cruiser, the Fylgia, and a submarine boat.

The Tapperheten, of 3650 tons, is ready for her trials.

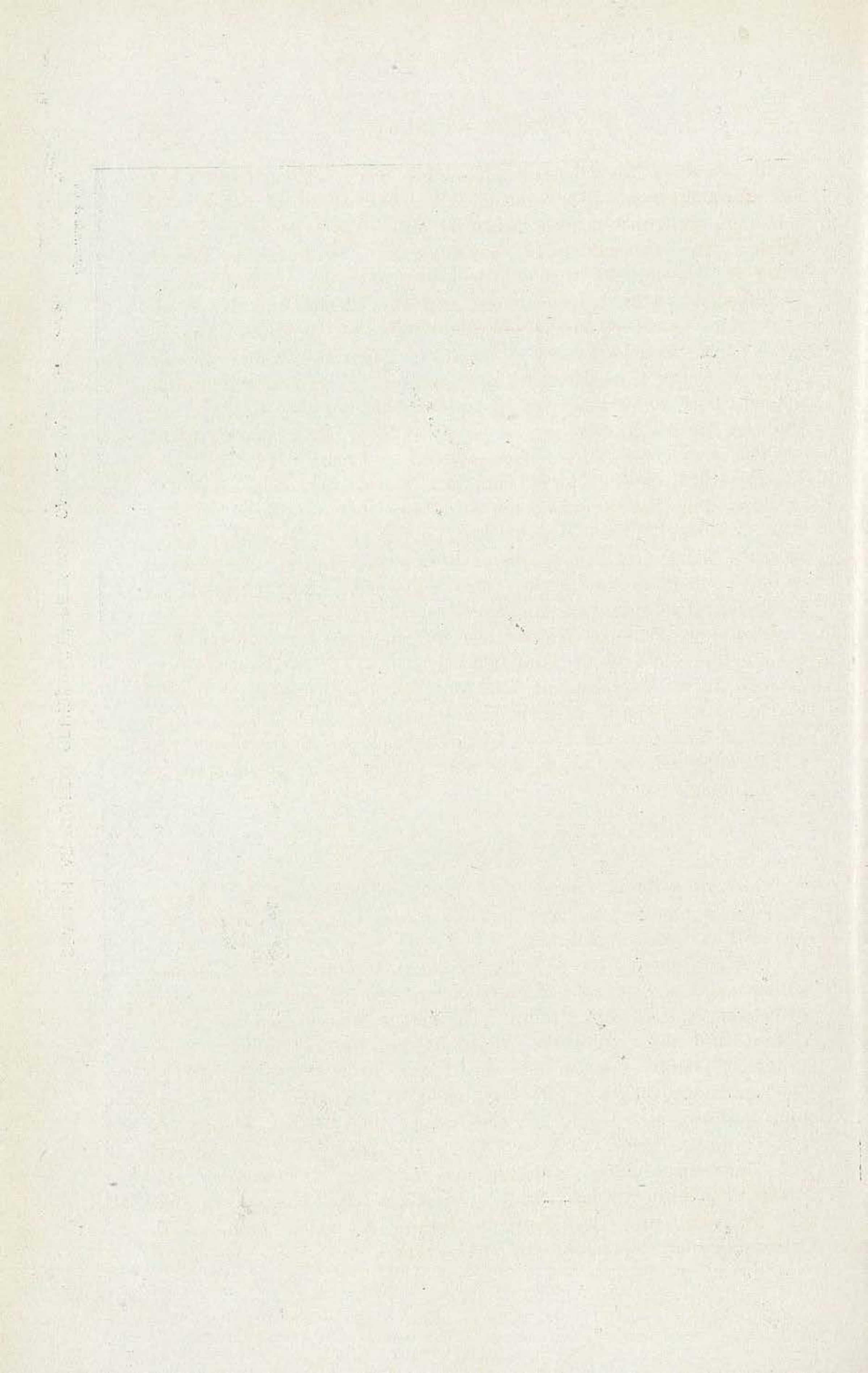
The coast-defence battleship Aeran, of 3700 tons, attained a speed of 17·25 knots with 6500 I.H.P. and a coal consumption of 1·78 lbs. She is furnished with eight Yarrow water-tube boilers.

The torpedo boat destroyer Mode, built by Messrs. Yarrow & Co.



Symonds & Co.

SPANISH ARMOURED CRUISER "EMPERADOR CARLOS V."



for the Swedish Navy, has completed her trials. With 6800 I.H.P. she attained a mean speed during three hours of 32·48 knots. The mean of six runs on the measured mile gave a speed of 32·130 knots. The dimensions of the Mode are as follows:—Length, 220¼ ft.; beam, 20½ ft.; displacement, 400 tons. The armament includes two 8-in. torpedo tubes, and one 12-pdr. and five 6-pdr. Q.F. guns. Coal is carried for 3000 miles at 13 knots. On the trials of the Mode *Engineering* remarks: "That the excellent results obtained in the Mode have not been reached by an undue lightening of scantlings is clearly proved by the fact that ten very similar boats, built by Messrs. Yarrow for the Japanese Navy, have been navigated without accident out from this country to Japan. It is, of course, possible that some of these boats had fair-weather trips, but it is inconceivable that the whole ten could each have steamed over the 11,000 miles between London and Yokohama without very heavy weather being met with by one or other of the flotilla. In short, it cannot be doubted that the low ratio of power to speed is due mainly to the excellent lines of the hull."

The new armoured cruiser, the Fylgia, is to be constructed at Stockholm at a cost of £350,000: length, 377¼ ft.; beam, 48¾ ft.; draught, 16 ft.; displacement, 4600 tons; armament, eight 5·9-in. and fourteen 2·2-in. guns, with two torpedo tubes. The armour on the belt and barbettes will be of 4-in. Krupp steel. Engines of 12,000 I.H.P., supplied by Yarrow water-tube boilers, are to give a speed of 21·5 knots.

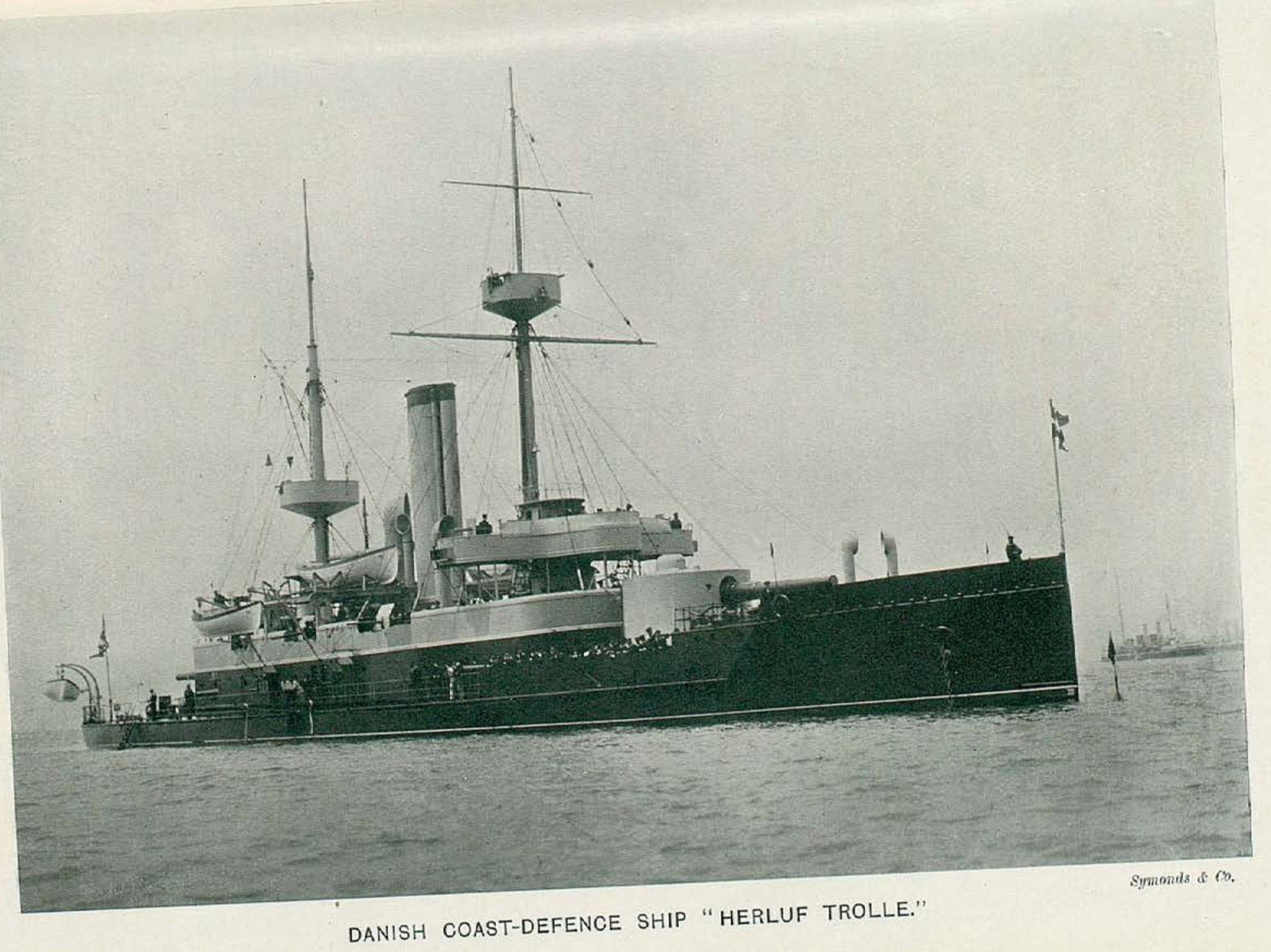
TURKEY.

The Messoudieh, which has been reconstructed by Messrs. Ansaldo, is reported to have attained a speed of 17·5 knots. She was still at Genoa in February.

Two cruisers of 3300 tons displacement, 12,000 I.H.P. (Niclausse boilers), and a speed of 22 knots, have been ordered from Messrs. Armstrong and Messrs. Cramp. The first is to be named the Abdul Hamid, and the second the Abdul Medjid (or Medjidia). Their dimensions are:—Length, 330 ft.; beam, 42 ft.; draught, 17 ft. The armament comprises two 6-in., eight 4·7-in., six 3-pr., six 1-pr. guns, and two above-water torpedo tubes. The protective deck has a maximum thickness of 4 in. The coal capacity is 275 tons, and the complement 280. The *Rivista Marittima* reports that the Turkish Government has signed a contract with Messrs. Ansaldo for reconstructing the four battleships Azizieh, Mahmudieh, Orkhanieh, and Osmanieh, and the armoured corvettes Avni-Illah,

Feth-i-Bulend, Muin-i-Zaffer, and Mukadim-i-Hair, the work to be executed on the Bosphorus. The battleships are to be rearmed with one 8-in. gun forward, one 6-in. gun aft, and eight 6-in. guns in the battery. It is most unlikely that this programme will be carried out. The Assar-i-Tewfik is at Kiel, but will not have the complete reconstruction intended. Messrs. Ansaldo have in hand two first-class torpedo boats of 164 tons and 24 knots speed.

T. A. BRASSEY.
JOHN LEYLAND.



Symonds & Co.

DANISH COAST-DEFENCE SHIP "HERLUF TROLLE."

CHAPTER III.

Comparative Strength.

There has been, during the past few years, a very considerable change in the distribution of naval strength, the result mainly of the additions to the British Mediterranean Fleet and the completion of some of the numerous battleships building for the German and Russian navies. The strength of European Powers is shifting from southern to northern Europe.

In the table on the next page is given a list of the ships in commission. Three first-class battleships have been added to the British Mediterranean Fleet, which now includes nine of our most modern and powerful battleships of the Majestic and Formidable classes, the Russell, the Vengeance, the Renown, and two of the Royal Sovereign class, or a total of fourteen battleships. The Hood has been withdrawn without relief, so that the net increase to the battleship strength is two ships. For this increase there is no apparent reason. Two armoured cruisers have relieved the Andromeda and Theseus, two second-class cruisers the Barham and Rupert. The French have, as last year, six first-class battleships in the permanent squadron and four in reserve. No additional force beyond the ordinary relief is contemplated. The second-class battleships Marceau and Magenta are in commission for training purposes at Toulon. The cruiser strength of the French Squadron remains approximately the same as before. The proposed composition of the French Mediterranean Squadron (which may be attained before the end of the year) is as follows :— Mediterranean.

Active Squadron.—Battleships : St. Louis, Jaureguiberry, Iéna, Charlemagne, Gaulois, Suffren (replacing the Bouvet). Armoured cruisers: Gueydon (replacing the Pothuau), Latouche-Tréville (to be relieved by Dupleix), Chanzy (to be relieved by Sully). Cruisers: Du Chayla, Galilée, Linois ; six destroyers of the Pertuisane type. France.

Reserve Squadron.—Battleships : Brennus, Carnot, Charles Martel, Hoche. Armoured cruisers: Pothuau, Charner, Bruix. Torpedo gunboat La Hire. Total Mediterranean complement, Active and Reserve, 6,807.

It is worthy of note that M. Pelletan, Minister of Marine, reduced the effectives of the active squadron by 1750 men during the

Class.	Great Britain. Mediterranean Fleet.	Great Britain. Channel Fleet.	Great Britain. Home Fleet.	France. Mediterranean Fleet. Permanent Squadron.	France. Mediterranean Fleet. Reserve Ships.	France. Northern Squadron.	Germany. —
Battleships	Bulwark Cæsar Formidable Illustrious Implacable Irresistible London Ramillies Renown Repulse Russell Venerable Vengeance Victorious	Hannibal Jupiter Magnificent Majestic Mars Prince George	Emp. of India Resolution Revenge Royal Sovereign Anson Benbow Camperdown Collingwood Sans Pareil Nile	Bouvet Charlemagne Gaulois Iéna Jauréguiberry Saint Louis	Brennus Charles Martel Carnot Magenta and Marceau (Toulon)	Devastation Masséna Bouvines Valmy Tréhouart	K. Friedrich III K. Wilhelm II K. Wilhelm der Grosse K. Barbarossa K. Karl der Grosse Wittelsbach Wettin Zähringen
Coast-Defence Ships	..	..	Conqueror Hero	Phlégéton (Bizerta)	Tempête	Cocyte (Dunkirk)	—
Cruisers, 1st Class	Aboukir Bacchante	Hogue Sutlej	..	Pothuau Chanzy Latouche-Tréville	..	Marseillaise Jeanne d'Arc	Prinz Heinrich
Cruisers, 2nd Class	Diana Gladiator Vindictive	Hermes Furious	Dido Venus	Du Chayla	..	Tage	Victoria Luise
Cruisers, 3rd Class	Naiad Hermione Intrepid Pandora Pegasus Pioneer Pyramus Mohawk	Pactolus Prometheus	Æolus Melampus Mersey	Linois Galilée	..	D'Estrées Troude	Amazone Ariadne Niobe
Torpedo Depôt Ship	Vulcan	..	..	..		..	—
Torpedo-Gunboats	3	..	..	Condor Flèche (Tunis) Casabianca „ Vautour (Constantinople)	Léger (Algeria) Lévrier (Corsica)	Lance (Lorient) Salve (Brest	Hela
Destroyers	20*	..	24	5	1	3	

winter months. M. Pelletan's action was severely criticised in the Russian Press and in the Chamber of Deputies. He defended himself by maintaining that the reduction was made simply because it was winter; war was not carried on in winter. Moreover, he had acted on good advice, and the effectives could at any moment be augmented. For thirty years the Mediterranean Squadron had mostly been at anchor at Toulon or cruising off the Riviera, and this work did not require 8000 sailors. He had reserved the money in order to construct more ships, 8,000,000f. more than last year being required. Bizerta Arsenal was more important than 1700 men, or less, for promenades. He was resolved to defend and strengthen the colonial empire, but to do this he had to save a million of francs here and a million of francs there.

The British Channel Fleet consists of six battleships of the Majestic class, two armoured cruisers of the Cressy class (in place of the Diadem and Niobe), two second-class and two third-class cruisers. The two latter are an addition since last year. Channel.

The British Home Fleet, as it is now called, has been reorganised and placed under a vice-admiral in command who will not fulfil the function of admiral superintendent of reserves. It consists, as before, of ten battleships, four of the first, six of the second-class. The Royal Sovereign has replaced the Nile, and presumably other ships of the class will be substituted for the Admirals, as the mounting of their upper deck guns in casemates is completed. Home Fleet.

The cruiser squadron consists of two new armoured cruisers, Drake and Good Hope, the fastest and most powerful ships of their class at present afloat; four second-class cruisers (two being temporarily attached to the Mediterranean Fleet), and the two third-class cruisers, Medea and Medusa. It is intended that four of the Monmouth class shall replace the second and third class cruisers as soon as they are completed. Cruiser squadron.

The French forces in the Atlantic had been completely re-organised. The Atlantic and North-American Squadrons were amalgamated with the cruiser division of the Northern Squadron (Escadre du Nord), and named "Force Navale de l'Atlantique," under the orders of a vice-admiral and of a rear-admiral, the force to be composed as follows:—(1) An armour-clad squadron, with vessels fully manned and equipped from April 1st to October 1st. (2) A cruiser division, provided permanently with full crews and equipment. (3) Torpedo-boat destroyers, fully armed and manned, to be attached to the armour-clad squadron. (4) An armed transport despatch vessel, equipped for eight months of the year for fishery service in Icelandic waters.

As is so often the case in French naval policy, the new Minister

of Marine reversed the decisions of his predecessor, and has gone back to the old order of things. The strength of the Northern Squadron has at present been reduced by the transfer of the Masséna to the Mediterranean, and by the Jemmapes being put out of commission, and it comprises only two second-class and three third-class battleships. The Atlantic Squadron is to be revived, and will comprise the Tage (to be relieved by the Desaix), and the third-class cruisers Troude and D'Estrées, which are included in the table with the French Northern Squadron. The Lavoisier is detached for the Newfoundland fisheries. The Northern Squadron will be in full commission for six months only. Its intended composition is as follows:—Battleships, Masséna, Devastation (to be replaced by Bouvet), Henri IV., Bouvines, Valmy, Tréhouart, Cruisers: Jeanne d'Arc, Marseillaise, Guichen. Torpedo gunboat Cassini and six destroyers of the Yatagan type. Total complements, 4513 officers and men.

Russia. The Russian naval force in the Black Sea includes the first-class battleships Tria Sviatitelia and Kniaz Potemkine Tavristchesky (barely completed) and the second-class battleships Georgi Pobiedonosetz, Dvenadzat Apostoloff, Rostislav, and the three older ships of the Sinope class, which are to be refitted.

The Nicolai I. and the new armoured cruiser Bayan are in commission in the Mediterranean.

In the Baltic, the Russians put a small squadron in commission during the summer months. Owing to the despatch of the most recently completed battleships to eastern Asia, the naval forces of Russia in the waters of northern Europe will not be formidable until the battleships now in hand are ready for sea.

Italy. Italy will have in commission in the Mediterranean during 1903 the following: Battleships; Regina Margherita, Saint Bon, E. Filiberto, Sicilia, Sardegna, Re Umberto, Doria, and R. di Lauria. Armoured cruisers; Garibaldi, Varese, and Carlo Alberto. Cruisers; Liguria, Minerva, and Euridice. Torpedo gunboats; Agordat and Coatit, and six destroyers. The destroyers will be in full commission throughout the year. The remaining ships will be in full commission for seven months and with reduced crews for five months.

Germany. The German Squadron in commission now comprises eight first-class battleships, viz., five of the "Kaiser" class and three of the Wittelsbach class, the Wittelsbach, Wettin, and Zähringen having been commissioned in October to take the place of the ships of the Brandenburg class, which are to receive new boilers and a general refit. The commissioning of ships during the winter months is a new departure. The squadron, of which a list is given in the table,

is the most powerful that Germany has ever put in commission. It will cruise in the Atlantic during the summer months.

In European waters, we have thirty battleships in commission, viz., twenty-four of the first and six of the second class, besides those in commission for training purposes. The French have fifteen battleships in commission, of which ten are of the first, three of the second, and two of the third class, besides the Marceau and Magenta, which are used as training ships. The Germans have eight first-class battleships in commission.

Excessive strength of British Mediterranean Fleet.

This brief review of the distribution of naval strength in European waters points to the conclusion that the strength of the British Mediterranean Fleet in battleships (not in cruisers) is excessive, and that the present requirements for the defence of the Empire would be better met by the strengthening of the Channel Fleet at the expense of that in the Mediterranean. The latter has been increased to fourteen battleships, including all our most powerful and recently-completed ships. The French have only six battleships in commission throughout the year, and of these the complements have been reduced during the winter months. They have four battleships in reserve. The strength of the British Mediterranean Fleet should obviously be sufficient to enable it to meet any force that might be brought against it on the outbreak of war. It is far more than sufficient to do this under present circumstances. Moreover, it must be borne in mind that in the event of war becoming imminent the Mediterranean Fleet could always be reinforced from the Channel Fleet, if such a course appeared necessary. The increase in the British naval forces in the Mediterranean has thrown a strain on the Malta dockyard which its resources are unable to meet, and is the main justification for the enormous sums of money now being spent on creating a dockyard at Gibraltar. Dockyards abroad can never be so efficient as the dockyards at home because they have not the same resources in men and material to draw upon. There is obviously great advantage in having as large a number of ships as possible with their base in home ports, where repairs can be more rapidly, more efficiently, and more economically executed. In making these observations there is certainly no intention to suggest that we should abandon the Mediterranean, as proposed by Sir William Clowes, either in peace or war. No waters can be abandoned to its enemy by the Power which claims to hold the command of the sea. To close up successfully both egresses from the Mediterranean would require exactly double the force that would be necessary to attack with a reasonable chance of victory any naval foe within it. Moreover our trade with Mediterranean ports constitutes too large a proportion of our

SHIPS IN COMMISSION.

EASTERN ASIA.

Class.	British.	French.	Russian.	German.
Battleships	Albion Glory Goliath Ocean	..	Petropavlovsk Poltava Sevastopol Peresviet Pobieda Retvizan	..
1st-Cl. Cruisers	Amphitrite Argonaut Cressy	Montcalm	Gromoboi Rurik Rossia	Fürst Bismarck
2nd-Cl. Cruisers	Blenheim Eclipse Talbot	Chateau-renault	Ad. Nahimoff Bogatyr Diana Pallada Varyag‡	Hansa Hertha
3rd-Cl. Cruisers	Pique Thetis	Bugeaud (Infernet) Pascal (Protet)	Boyarin Razboynik Zabiyaka	Bussard Geier Seeadler Thetis
Armoured Gunboats	..	Achéron† Styx†	Gremiastchy Otvazny	..
Sloops and Gunboats	11*	5*	3	4*
Torpedo-Gunboats	..	..	3	..
Destroyers	3	2	5	1

* Excluding river gunboats.
† These, as well as the Redoubtable, Vauban, and three gunboats are in reserve.
‡ Persian Gulf.

over-sea trade to be given up without a struggle even in time of war.

The agitation for an increase in the Mediterranean Fleet which, for the reasons already given, was quite unjustified by the naval forces maintained in commission by other Powers, has been succeeded by an agitation for the formation of a North Sea Squadron and the establishment of a naval base on the North Sea. As regards the latter demand, it may be observed that, if Dover harbour, on which £3,500,000 is being spent, was not intended to serve as the coal depot and supply base for the squadron that may be required to operate in the North Sea in the event of war, this work should never have been undertaken. So far as repairing resources are concerned, private yards should be available for His Majesty's ships in time of war. As regards the suggestion for a localised squadron, it may be pointed out that we have in the Channel and Home Squadrons no less than sixteen battleships—ten of the first and six of the second-class—whereas the Germans have eight of the first-class, the French two of the second-class and two of the third. North Sea Squadron.

The British Squadron in Chinese waters includes the same four battleships as last year, but the number of cruisers has been reduced. The Amphitrite has replaced the Terrible and Endymion. The Aurora, Orlando, and Astræa have been withdrawn, and the Thetis has relieved the Arethusa. No less than eleven sloops and gunboats, besides river gunboats, are still in commission in China, a number which appears excessive. For the suppression of piracy, which is still common in the China seas, a few light-draught fast cruisers would be more effective. Naval strength in the Far East.

The whole of the French naval forces in the East, from Madagascar to Noumea, were to have been brought under one command, known as that of the "Mers d'Orient," and organised in two divisions. This decision of his predecessor has also been reversed by M. Pelletan. The French China Squadron (Escadre de l'Extrême-Orient) is to include the new armoured cruisers Montcalm (flagship of the Vice-Admiral), and Kléber; the commerce destroyer Châteaurenault; the second-class cruiser Jurien de la Gravière; the third-class cruisers Pascal and Bugeaud, and five gunboats. The old battleship Redoutable, the old armoured cruiser Vauban, the armoured gunboats Achéron and Styx, and three gunboats will be in reserve at Saïgon. The ships at present in commission are given in the table. The Chateaurenault is already on the station. The Montcalm left Toulon on February 7. The Guichen, Jurien de la Gravière, and Sfax have not yet joined. France.

The Russian Squadron has recently been strengthened by the new first-class battleships Retvizan and Pobieda, and the second-class

SHIPS IN COMMISSION.

ATLANTIC.

Class.	British.		United States.
	Cape.	North America.	
Battleships	..	..	Kearsarge Alabama Illinois Indiana Massachusetts Iowa Texas
Coast-Defence Ship	..	Hotspur	
1st-Cl. Cruisers	..	Ariadne	..
2nd-Cl. Cruisers	Gibraltar	..	Olympia Atlanta (Caribbean)
3rd-Cl. Cruisers	Barracouta Blanche Forte Pearl Terpsichore	Cambrian Charybdis Indefatigable Retribution Tribune Pallas	Newark Montgomery Detroit (South Atlantic)
Sloops and Gunboats	5	3	5
Destroyers	..	1	..

PACIFIC.

Class.	British.		French.
	Australian Station.	Pacific Station.	
2nd-Cl. Cruisers	Royal Arthur	Grafton	..
3rd Cl. Cruisers	Katoomba Mildura Ringarooma Wallaroo Phœbe Archer	Amphion Flora	Protet
Sloops and Gunboats	4	1	..
Destroyer	..	1	..
Torpedo-Gunboat	1 (1 *in reserve*)	..	..

* United States: New York, Boston, Marblehead, and three gunboats.

cruisers Diana, Pallada, and Bogatyr. The third-class cruisers Boyarin and Novik, of 25 knots speed, are to proceed to China when completed. The squadron now comprises six first-class battleships, and in this respect is more powerful than the British Squadron in Chinese waters. In cruisers, the two squadrons are about equal. In view of the alliance with Japan, which can throw six first-class battleships and the same number of first-class cruisers into the scale, the strength of the British Squadron is ample for our needs.

East Indies station.

The British Squadron on the East Indies station remains the same as last year. It includes the second-class cruiser Highflyer, the third-class crusiers Cossack, Perseus, and Pomone; two sloops or gunboats, besides two torpedo gunboats, and the Abyssinia and Magdala, one of each being in reserve. The French have in the East Indies the third-class cruiser Infernet and a gunboat.

Atlantic stations.

There has been some change in the distribution of squadrons in the Atlantic. The West Coast of Africa is to be severed from the Cape Station and with the South-East Coast of America formed into a new station to be called the South Atlantic station with its bases at Gibraltar and Sierra Leone.* From the Cape station two third-class cruisers have been withdrawn, and the gunboats Thrush and Rattler have been relieved by the Odin, but five sloops and gunboats are still included in the squadron. On the North-America station the Ariadne has relieved the Crescent as flagship. One second-class and one third-class cruiser have been added to the squadron. The intention (announced by the First Lord in his Memorandum) to reduce the number of vessels on the South-East Coast of America to one cruiser and one sloop has been carried out, the Basilisk having been withdrawn. Information as to the composition of the South Atlantic Squadron is not available at the time of writing.

Pacific.

On the Pacific station it is satisfactory to note that two sloops have been withdrawn, and that the squadron now consists of one first-class and two second-class cruisers and one sloop. The French have in the Pacific the third-class cruiser Protet and a gunboat. The future composition of the Australian Squadron was discussed at the Colonial Conference. We have, in previous numbers, pointed out the unsuitability of the third-class cruisers of the Katoomba or Pearl type, for service in the heavy weather frequently experienced on the south coast of Australia. If the agreement adopted at the Colonial Conference is carried out, the Australian Squadron will then consist of one armoured cruiser, first-class, two second-class cruisers, four third-class cruisers, and four sloops. The sphere of operations of the squadron is extended to the waters of the China and East Indies

* Cf. First Lord's Memorandum for composition of squadrons.

stations—a great improvement on the agreement of 1887, by which the employment of the naval force to which Australia contributed was limited to Australian waters.*

In the squadrons maintained in commission in distant stations, though there is a slight improvement on last year, the amount of naval force dissipated in vessels which are valueless for the purpose of modern warfare is still a regrettable feature.

Changes in tables.

Some special explanations as to the reason of various changes in the tables are necessary. Though many have advocated the transfer of the Royal Sovereign and her sister ships to the second class, these vessels have been retained in the first class because the whole of their secondary armament is now carried in casemates, thus much increasing their offensive power. The Ré Umberto, Sardegna, and Sicilia have been transferred to the second class because they are so badly protected. They are rather armoured cruisers than battleships, and their protection is not equal to that of many modern armoured cruisers. From the list of third-class battleships, or coastguard ships, many ineffective ships have been removed, including the Inflexible, Sultan, Hercules, Monarch, Orion, Hotspur, Abyssinia, and Magdala, the Popoff and Novgorod, of the Russian Navy, and the Hei-Yen, of the Japanese Navy, whose displacement is only 2000 tons. In addition to the above the Alexandra, Devastation, Thunderer and Dreadnought are considered by the Admiralty ineffective ships, but until the Tonnerre and Vengeur, the Peter Veliky, the Kaiser and Deutschland are removed from the list of foreign navies, they should be retained in the British list.

Turning to the cruiser classes, the Blake and Blenheim and the nine Edgars have been transferred to the second class. The Blakes and Edgar class (excellent ships as they still are in many respects) only carry four of their 6-in. guns in casemates. The Powerful and Terrible and the eight Diadems are retained in the first class, though only protected ships, because they carry the whole of their armament in a casemate or turret. The commerce-destroyers, Guichen and Châteaurenault, of the French Navy, the Columbia and Minneapolis, of the United States Navy, the Russian Aurora and Askold classes, the German Kaiserin Augusta, and the new French Desaix class, do not possess sufficient power to justify their retention in the first class. The Nahimoff and Pamyat Azova, like our Orlando class, are deficient in speed. With one exception, that of the Fürst Bismarck, all ships in Class I. have a speed of 20 knots. The Rurik has been transferred to Class II. because she fails in speed, and her armament is absolutely unprotected; in fact, in defensive qualities she is a very weak ship.

* Cf. Part IV. p. 485 for draft agreement.

The transfer of the Carlo Alberto and the Vettor Pisani to the second class is open to question. They have a large area of armoured side, but they carry no gun above the 6-in., and of the eighteen 4·7-in. and 6-in. guns carried only eight are protected behind armour.

As a consequence of the re-arrangement of Class I, all the Naval Defence Act cruisers, of which there are 28, and some of older date, drop into the third class, and with them go a large proportion of the French, Italian, German, and Japanese vessels. All unprotected cruisers, and the smaller protected cruisers having a speed of under 18 knots, are struck out of the lists—though several are still in commission, and may be fairly effective for commerce protection against privateers. The result of the re-classification is to considerably improve our position as far as first-class cruisers are concerned, but in the other classes our position is not so good.

Relative strength. Battleships.

The additions to the battleship strength of the various navies during the past year have not been very numerous. Germany is almost the only Power that has succeeded in carrying out its programme, and, as a consequence, the German Navy stands now, for the first time, second to our own in completed first-class battleships. In this, the chief element of naval strength, we are more than up to the two-Power standard. We have 33 first-class battleships completed, as compared with Germany 12, France 10, Russia 9, and the United States 9. In completed battleships of the first class, we are equal to a combination of any three Powers; but if we include vessels under construction, we have 43 ships to a total of 56 for France, Germany, and the United States. In second-class battleships, a Franco-Russian combination would out-number us by two to one.

Programme and future position.

During the year there are to be laid down for the British Navy three first-class battleships, for Germany two, for the United States five (three of 16,000 tons and two of 13,000 tons), while two battleships of 16,000 tons are reported to be in contemplation for the Russian Navy. The position in 1904 will probably be as follows :—

	England.	Germany.	United States.	France.	Russia.
Battleships 1st Class—Built ..	38	14	12	11	11
,, ,, Building ..	8	6	12	6	6
Total ..	46	20	24	17	17

In completed first-class battleships we shall therefore be equal to a combination of any three Powers. The position in 1905 cannot be calculated with any degree of certainty. The following is a probable estimate of the numbers of completed battleships. No

estimate can, of course, be given of the numbers under construction, which are dependent on the programmes adopted a year hence :—

	England.	Germany.	United States.	France.	Russia.
Battleships 1st Class	40	16	17	13	13

The above estimate for the United States is a liberal one. In 1905 the British Navy will, in first-class battleships, still be practically equal to a combination of any three Powers.

In the important class of armoured cruisers, which in the latest designs are approaching the battleship in offensive and defensive power, the present position is satisfactory. We have (including the protected cruisers Powerful, Terrible, and Diadem class) twenty completed to a total of ten for Germany, France, Russia, and the United States. In 1904 the position will probably be as follows :—

	England.	Germany.	United States.	France.	Russia.
1st Class Cruisers—Built	30	3	2	6	3
,, ,, Building ..	12	2	9	5	?
Total ..	42	5	11	11	3

The programme of construction for the British Navy as regards battleships and first-class cruisers appears sufficient to meet the efforts which are being made elsewhere. A larger number of medium-sized cruisers are needed for the protection of commerce.

T. A. BRASSEY.

Comparative Tables of British, French, Russian, Italian, German, United States, and Japanese Ships.

TABLE I.—FIRST-CLASS BATTLESHIPS.

GREAT BRITAIN.

Launched.	Name.	Displacement.
		tons.
1891	Empress of India	
1891	Hood	
1892	Ramillies	
1892	Repulse	14,150
1892	Resolution ...	
1892	Revenge	
1892	Royal Oak ...	
1891	Royal Sovereign	
1895	Renown	12,350
1894	Magnificent ...	
1895	Majestic	
1895	Prince George ...	
1895	Victorious ...	
1896	Cæsar	14,900
1896	Hannibal	
1896	Illustrious ...	
1895	Jupiter	
1896	Mars	
1897	Canopus	
1899	Glory	
1898	Albion	12,950
1898	Goliath	
1898	Ocean	
1899	Vengeance ...	
1898	Formidable ...	
1898	Irresistible ...	
1899	Implacable ...	15,000
1899	London	
1899	Venerable ...	
1899	Bulwark	
1901	*Albemarle* ...	
1901	*Cornwallis* ...	
1901	*Duncan*	14,000
1901	*Exmouth*	
1901	Russell	
1901	Montagu	
1902	*Queen*	15,000
1902	*Prince of Wales*	
	Edward VII. ...	
	Commonwealth	
	Dominion ...	16,350
	Hindustan ...	
	New Zealand ...	
	43 ships.*	

FRANCE.

Launched.	Name.	Displacement.
		tons.
1891	Brennus	11,190
1894	Carnot	11,954
1893	Charles Martel	11,693
1893	Jauréguiberry...	11,637
1895	Masséna	11,735
1896	Bouvet	12,007
1895	Charlemagne ...	11,108
1896	Gaulois	11,105
1896	St. Louis	11,090
1898	Iéna	11,861
1899	Suffren	12,527
	Patrie	
	République ...	
	Liberté	14,630
	Justice	
	Vérité	
	Democratie ...	
	17 ships.	

RUSSIA.

Launched.	Name.	Displacement.
		tons.
1892	Tria Sviatitelia	12,480
1900	*Kniaz Potemkine*	12,600
1894	Petropavlovsk...	
1894	Poltava	10,960
1895	Sevastopol ...	
1898	Peresviet	
1898	Oslabya	12,674
1900	Pobieda	
1900	Retvizan	12,700
1901	*Cesarevitch* ...	12,900
1901	*Borodino*	
1901	*Alexander III.*...	
1901	*Orel*	13,516
1902	*Kniaz Souvaroff*	
	Slava	
	15 ships.‡	

ITALY.

Launched.	Name.	Displacement.
		tons.
1897	E. Filiberto ...	9,015
1897	Saint Bon... ...	
1901	*Ra Margherita*	13,214
1901	*Benedetto Brin*	
	Ra Elena... ...	12,425
	Emanuele III. .	
	6 ships.‖	

GERMANY.

Launched.	Name.	Displacement.
		tons.
1891	Brandenburg ...	
1891	Kurfürst Friedrich Wilhelm	9,874
1891	Weissenburg ...	
1892	Wörth	
1896	Kaiser Friedrich III.	
1897	Kaiser Wilhelm II.	
1899	Kaiser Wilhelm der Grosse ...	10,905
1900	Kaiser Barbarossa	
1899	Kaiser Karl der Grosse ...	
1900	Wittelsbach ...	
1901	Wettin	
1901	Zähringen ...	11,611
1901	*Mecklenburg* ...	
1901	*Schwaben*... ...	
1902	*Braunschweig*	
	J	
	K	12,792
	L	
	M	
	N	
	20 ships.	

UNITED STATES.

Launched.	Name.	Displacement.
		tons.
1893	Indiana	
1893	Massachusetts...	10,288
1893	Oregon	
1896	Iowa...	11,340
1898	Kearsarge... ...	11,540
1898	Kentucky... ...	
1898	Alabama	11,565
1898	Illinois	
1898	Wisconsin ...	11,653
1901	Maine	12,300
1901	*Missouri*	12,230
1901	*Ohio*	12,440
	New Jersey ...	
	Georgia	
	Virginia	14,948
	Pennsylvania	
	Rhode Island...	
	Connecticut ...	16,500
	Louisiana ...	
	19 ships.¶	

JAPAN.

Launched.	Name.	Displacement.
		tons.
1896	Fuji	12,450
1896	Yashima	12,300
1899	Asahi	15,000
1899	Hatsuse	15,000
1898	Shikishima ...	14,850
1900	Mikasa	14,500
	6 ships.	

* 3 projected. ‡ 2 projected (?). ‖ 2 Emanuele type projected. ¶ 3 of 16,000 tons, 2 of 13,000 tons to be laid down in 1903.

TABLE II.—SECOND-CLASS BATTLESHIPS.

GREAT BRITAIN.			FRANCE.			RUSSIA.			ITALY.			GERMANY.			UNITED STATES.			JAPAN.		
Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.
		tons.			tons.			tons.			tons.									
1888	Nile	11,940 (Nile and Trafalgar)	1883	Baudin	11,442	1892	Georgi Pobiedonosetz	10,280	1880	Italia...	15,407									
1887	Trafalgar... ...		1879	Duperré	11,032	1891	Navarin	9,476	1883	Lepanto	15,549									
1886	Anson	10,600	1881	Courbet	10,368	1886	Catherine II. ...		1885	Andrea Doria ...	11,027									
1885	Benbow	10,600	1879	Dévastation ...	10,535	1887	Sinope	10,181 (Catherine II., Sinope and Tchesmé)	1884	R. di Lauria ...	10,997									
1885	Camperdown ...	10,600	1885	Formidable ...	11,391	1886	Tchesmé		1885	F. Morosini ...	11,145									
1882	Collingwood ...	9,500	1886	Hoche	10,823	1894	Sissoi Veliky ...	8,880 (Sissoi Veliky and Rostislav)	1888	Re Umberto ...	13,673									
1885	Howe	10,300	1890	Magenta	10,680	1896	Rostislav		1890	Sardegna	13,640									
1884	Rodney	10,300	1887	Marceau	10,679	1889	Nicolai I.	9,500 (Nicolai I. and Alexander II.)	1891	Sicilia	13,087									
1887	Sans Pareil ...	10,470	1887	Neptune	10,810	1887	Alexander II. ...													
1893	Barfleur	10,500 (Barfleur and Centurion)	1899	Henri IV. ...	8,807	1890	Dvenadzat Apostoloff ...	8,400												
1892	Centurion... ...																			
	11 ships.			10 ships.			10 ships.			8 ships.										

TABLE III.—THIRD-CLASS BATTLESHIPS AND COAST DEFENCE SHIPS.

GREAT BRITAIN.			FRANCE.			RUSSIA.			ITALY.			GERMANY.			UNITED STATES.			JAPAN.		
Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.
		tons.			tons.			tons.			tons.			tons.			tons.			tons.
1875	Alexandra* ...	9.490	1876	Redoutable* ...	9,224	1872	Peter Veliky*...	9,665	1878	Dandolo*	12,071	1880	Baden	7,283	1892	Texas	6,315	1882	Chin Yen* ...	7,220
1382	Colossus	9,420	1885	Caïman	7,495	1894	Adm. Senjavin	4,126	1876	Duilio*	10,962	1878	Bayern		1883	Amphitrite* ...	3,990			
1882	Edinburgh ...		1883	Indomptable ...	7,463	1893	Adm. Oushakoff					1877	Sachsen		1876	Miantonomoh*				
1871	Devastation* ...	9,330	1885	Requin	7,698	1896	Gen. Adm. Apraxine ...					1878	Württemberg ...		1883	Monadnock* ...				
1872	Thunderer* ...		1881	Terrible	7,455							1874	Deutschland* ...	7,555	1883	Terror*				
1875	Dreadnought...	10,820	1892	Bouvines	6,691							1874	Kaiser*		1891	Monterey... ...	4,084			
1881	Conqueror... ...	6,200	1893	Tréhouart... ...	6,671							1884	Oldenburg ...	5,118	1884	Puritan	6,060			
1885	Hero		1892	Jemmapes ...	6,474							1890	Beowulf	4,048	1900	*Arkansas*... ...	3,235			
			1892	Valmy								1893	Hagen		1900	*Nevada*	3,228			
			1877	Fulminant ...	5,871							1892	Heimdall		1901	*Florida*	3,235			
			1883	Furieux	5,925							1892	Hildebrand ...		1900	*Wyoming*... ...	3,218			
			1876	Tempête*... ...	4,793							1894	Odin							
			1880	Tonnant*... ...	5,010							1891	Frithjof	3,440						
			1875	Tonnerre* ...	5,765							1889	Siegfried							
			1878	Vengeur*... ...	4,635							1895	Ægir...	3,474						
	8 ships.			15 ships.			4 ships.			2 ships.			15 ships.			11 ships.			1 ship.	

* Of doubtful efficiency or ineffective.

TABLE IV.—FIRST-CLASS CRUISERS.

GREAT BRITAIN.

Speed.	Name.	Displacement.
kts.		tons.
22	Powerful	14,200
22	Terrible	
20¼	Andromeda ...	
20¼	Diadem	11,000
20¼	Europa	
20¼	Niobe	
20¼	Amphitrite ...	
20¼	Argonaut	11,000
20¼	Ariadne	
20¼	Spartiate	
21	Aboukir	
21	Bacchante ...	
21	Cressy	12,000
21	Euryalus	
21	Hogue	
21	Sutlej	
23	Drake	
23	Good Hope ...	14,100
23	King Alfred ...	
23	Leviathan ...	
23	*Monmouth* ...	
23	*Kent*	
23	*Bedford*	
23	*Essex*	
23	*Berwick*	9,800
23	*Cornwall*	
23	*Cumberland* ...	
23	*Donegal*	
23	*Lancaster* ...	
23	*Suffolk*	
22¼	*Devonshire* ...	
22¼	*Antrim*	
22¼	*Argyll*	10,700
22¼	*Carnarvon* ...	
22¼	*Hampshire* ...	
22¼	*Roxburgh* ...	
22¼	*Duke of Edinburgh*	13,500
22¼	*Black Prince* ..	
	38 ships.*	

FRANCE.

Speed.	Name.	Displacement.
kts.		tons.
23	Jeanne d'Arc ...	11,092
21	Gueydon	
21	Montcalm ...	9,367
21	*Dupetit Thouars*	
21	*Condé*	
21	*Sully*	
21	*Gloire*	9,856
21	*Marseillaise* ...	
21	*Amiral Aube* ...	
21	*Léon Gambetta*	
21	*Jules Ferry* ...	12,351
21	*Victor Hugo* ...	
21	*Jules Michelet*..	
22	*Ernest Renan*...	13,562
	14 ships.	

RUSSIA.

Speed.	Name.	Displacement.
kts.		tons.
20	Rossia	12,200
20	Gromoboi	12,364
21	Bayan	7,800
	3 ships.	

ITALY.

Speed.	Name.	Displacement.
kts.		tons.
20	Giuseppe Garibaldi	
20	Varese	7,294
20	*F. Ferruccio* ...	
	3 ships.	

GERMANY.

Speed.	Name.	Displacement.
kts.		tons.
19	Fürst Bismarck	10,482
20½	Prinz Heinrich	8,759
20½	Prinz Adalbert	8,908
20½	*Friedrich Karl*	
	Kaiser Ersatz...	
	Deutschland	9,361
	Ersatz	
	6 ships.	

UNITED STATES.

Speed.	Name.	Displacement.
kts.		tons.
21·9	Brooklyn	9,215
21	New York ...	8,200
22	*West Virginia*	
22	*California* ...	
22	*Colorado*	13,680
22	*Maryland* ...	
22	*Nebraska*	
22	*South Dakota*...	
22	*St. Louis*	
22	*Charleston* ..	9,700
22	*Milwaukee* ...	
22	*Washington* ...	14,500
22	*Tennessee*... ...	
	13 ships.	

JAPAN.

Speed.	Name.	Displacement.
kts.		tons.
21¼	Asama	9,700
21¼	Tokiwa	
21	Azuma	9 400
20	Yakumo	9,850
21	Idzumo	9,750
21	Iwate	
	6 ships	

* 4 projected.

TABLE V.—SECOND-CLASS CRUISERS.

GREAT BRITAIN.

Speed.	Name.	Displacement.
kts.		tons.
16	Impérieuse	8,400
16	Warspite	
16	Aurora	
16	Australia	
16	Galatea	
16	Immortalité ...	5,600
16	Narcissus	
16	Orlando	
16	Undaunted ...	
21½	Blake	9,000
21½	Blenheim	
19¾	Crescent	7,700
20	Edgar	7,350
20	Endymion ...	7,350
19¾	Gibraltar	7,700
20	Grafton	7,350
20	Hawke	7,350
19¾	Royal Arthur ...	7,700
19¾	St. George ...	7,700
20	Theseus	7,350
19½	Diana	
19½	Dido	
19½	Doris	
19½	Eclipse	
19½	Isis	5,600
19½	Juno	
19½	Minerva	
19½	Talbot	
19½	Venus	
19	Arrogant ...	
19	Furious	5,750
19	Gladiator	
19	Vindictive ...	
20	Hermes	
20	Highflyer	5,600
20	Hyacinth	
21	*Challenger* ...	5,880
21	*Encounter* ...	
	40 ships.	

FRANCE.

Speed.	Name.	Displacement.
kts.		tons.
20	Dupuy de Lôme	6,676
19	D'Entrecasteaux	7,995
23	Guichen	8,151
23	Châteaurenault	7,898
18	Bruix	4,735
18	Chanzy	4,736
18	Charner	4,702
18	Latouche-Tréville	4,681
19	Pothuau	5,374
19	Cécille	5,839
19	Tage	7,469
23	*Jurien de la Gravière* ...	5,595
21	*Desaix*	
21	*Dupleix*	7,578
21	*Kléber*	
	15 ships.	

RUSSIA.

Speed.	Name.	Displacement.
kts.		tons.
16¼	Adm. Nahimoff	8,500
18	Pamyat Azova	6,600
18	Rurik	10,933
16	Dmitri Donskoi	5,796
20	Aurora	
20	Diana	6,630
20	Pallada	
23	Askold	6,000
23	Varyag	6,500
23	Bogatyr	
23	*Kagul*	6,570
23	*Otchakoff*	
23	*Oleg*	
	13 ships.	

ITALY.

Speed.	Name.	Displacement.
kts.		tons.
20	Carlo Alberto ...	6,396
20	Vettor Pisani ...	
19	Marco Polo ...	4,511
	3 ships.	

GERMANY.

Speed.	Name.	Displacement.
kts.		tons.
21	Kaiserin Augusta	5,956
21	Freya	
21	Hertha	5,569
21	Victoria Luise	
21	Hansa	5,791
21	Vineta	
	6 ships.	

UNITED STATES.

Speed.	Name.	Displacement.
kts.		tons.
22·8	Columbia	7,375
23	Minneapolis ...	
21½	Olympia	5,800
	3 ships.	

JAPAN.

Speed.	Name.	Displacement.
kts.		tons.
22	Chitose	4,798
22	Kasagi	4,784
23	Takasago	4,180
23	Yoshino	
	4 ships.	

TABLE VI.—THIRD-CLASS CRUISERS.

GREAT BRITAIN.

Speed.	Name.	Displacement.
kts.		tons.
17	Forth	
17	Mersey	
17	Severn	4,050
17	Thames	
19	Astræa	
19½	Bonaventure ...	
19½	Cambrian... ...	
19½	Charybdis ...	4,360
19½	Flora...	
19½	Forte...	
19½	Fox	
19½	Hermione... ...	
19¾	Æolus	3,600
20	Andromache ...	3,400
20	Apollo	3,400
19¾	Brilliant	3,600
19¾	Indefatigable ...	3,600
19¾	Intrepid	3,600
19¾	Iphigenia	3,600
20	Latona	3,400
20	Melampus ...	3,400
20	Naiad	3,400
19¾	Pique	3,600
19¾	Rainbow	3,600
19¾	Retribution ...	3,600
20	Sappho	3,400
20	Scylla	3,400
19¾	Sirius	3,600
19¾	Spartan	3,600
20	Terpsichore ...	3,400
20	Thetis	3,400
20	Tribune	3,400
19	Magicienne ...	
19	Marathon ...	
19	Melpomene ...	2,950
20	Medea	
20	Medusa	2,800
19	Pallas	
19	Pearl	
19	Philomel	
19	Phœbe	
19	Katoomba ...	
19	Mildura	2,575
19	Ringarooma ...	
19	Tauranga... ...	
19	Wallaroo	
20¼	Pelorus	
20	Proserpine ...	
20	Pactolus	
20	Pegasus	
20	Perseus	
20	Pomone	2,135
20	Prometheus ...	
20	Psyche	
20	Pyramus	
20	Pandora	
20	Pioneer	2,200
21¾	*Amethyst*	
21¾	*Diamond*	
21¾	*Sapphire*	3,000
21¾	*Topaze*	
25	*Adventure*† ...	2,750
25	*Forward*	2,545
25	*Pathfinder* ...	2,900
25	*Sentinel*	2,610
	* 69 ships.	

FRANCE.

Speed.	Name.	Displacement.
kts.		tons.
19¼	Coëtlogon	1,901
20½	Cosmao	1,923
20½	Forbin	1,935
20½	Lalande	1,965
20¼	Surcouf	2,012
20½	Troude	1,994
20	Davout	3,031
20	Linois	2,308
20	Galilée	2,318
20	Lavoisier	2,285
20½	D'Estrees	2,421
20½	Infernet	2,435
19½	Alger	4,313
19	Isly	4,406
19	Jean Bart... ...	4,014
19¼	Bugeaud	3,809
19¼	Chasseloup-Laubat ...	3,824
19¾	Friant	3,882
19¾	Pascal	3,951
19	Descartes	3,970
17	Sfax	4,561
20	Suchet	3,362
19	Cassard	3,890
19	D'Assas	3,962
19	Du Chayla ...	3,890
19	Catinat	4,048
19	Protet	4,001
	27 ships.	

RUSSIA.

Speed.	Name.	Displacement.
kts.		tons.
17½	Adm. Korniloff	5,800
20	Svietlana	3,862
25	Novik	3,000
25	Poyarin	3,200
25	*Almaz*	
25	*Jemtchug*	3,000
25	*Izumrud*	
25	*Unnamed* ...	
	8 ships.	

ITALY.

Speed.	Name.	Displacement.
kts.		tons.
20	Vesuvio	3 373
18	Etna	3,470
17½	Fieramosca ...	3,534
19	Stromboli... ...	3,836
21	Piemonte	2,597
19	Calabria	2,428
19½	Dogali	2,055
18	Elba	2,690
17½	Giovanni Bausan	3,277
19	Etruria	
18	Liguria	2,245
18	Umbria	
21	Lombardia ...	2,351
20	Puglia	2,498
	14 ships.	

GERMANY.

Speed.	Name.	Displacement.
kts.		tons.
20	Gefion	4,044
20	Irene...	4,330
19	Prinzess Wilhelm ...	
23	Greif...	1,971
23	Hela	
19	Gazelle	
21½	Nymphe	
21½	Niobe	
21	Ariadne	2,600
21	*Medusa*	
21	Thetis	
21	*Amazone*	
22	*Frauenlob* ...	
22	*Arcona*	2,672
22	*Undine*	
22	*K*	
22	*L*	
22	*Ersatz Zieten* ...	3,000
22	*M*	
22	*Ersatz Merkur*	
	20 ships.	

UNITED STATES.

Speed.	Name.	Displacement.
kts.		tons.
18½	Detroit	
18½	Marblehead ...	2,089
18½	Montgomery ...	
16½	*Denver*	
16½	*Des Moines* ...	
16½	*Chattanooga* ...	3,400
16½	*Galveston* ...	
16½	*Tacoma*	
16½	*Cleveland*... ...	
20	Albany	3,600
20	Baltimore... ...	4,413
18	Chicago	4,500
19	Newark	4,098
20	New Orleans ...	3,600
19½	Philadelphia ...	4,324
19	Cincinnati ...	3,213
19	Raleigh	
19½	San Francisco...	4,098
	18 ships.	

JAPAN.

Speed.	Name.	Displacement.
kts.		tons.
20	Akashi	2,700
20	Suma	
19	Akitsushima ...	3,150
18	Idzumi	2,950
20	Yayeyama ...	1,600
19	Chiyoda	2,450
20	*Miyako*	1,800
20	*Niitaka*	3,365
20	*Tsushima*... ...	
17	Hashidate ...	
17	Itsukushima ...	4,277
17	Matsushima ...	
18½	Naniwa	3,700
18½	Takachiho ...	
	14 ships.	

* 4 Gem class, 4 Scout class projected.

TABLE VII.—TORPEDO GUNBOATS.

GREAT BRITAIN.			FRANCE.			RUSSIA.			ITALY.			GERMANY.			UNITED STATES.			JAPAN.		
Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.
kts.		tons.	kts.		tons	kts.		tons.	kts.		tons.	kts.		tons.				kts.		tons.
19	Grasshopper ...	525	17¼	Condor	1229	20	Captain Sacken	742	20	Aretusa	833	19	Jagd...	1230				21	Tatsuta	875
18¼	Rattlesnake ...	550	17	Epervier	1268	20	Lieutenant Ilyn	700	20	Calatafimi ...	833	21	Komet	931				21	*Chihaya*	875
20	Assaye		17½	Faucon	1311	22	Gaidamak ...		21	Caprera	833	21	Meteor							
20	Boomerang ...		18	Fleurus	1289	22	Vzadnik	400	20	Euridice	905									
20	Gleaner		17½	Vautour	1266	22	Griden		19	Goito...	843									
19	Gossamer... ...		18½	Wattignies ...	1272	21	Kazarsky... ...		19½	Iride	931									
20	Karrakatta ...		18½	Bombe	413	22	Posaduik	462	19	Minerva	833									
20	Plassy	735	18	Couleuvrine ...	369	22	Voevoda	448	19	Montabello ...	801									
20	Salamander ...		18	Dague	402	21	Abrek	535	19	Monzambano ...	856									
20	Seagull		18	Dragonne... ...	403				19	Partenope... ...	821									
20	Sharpshooter ...		18	Flèche	418				18	Tripoli	835									
20	Sheldrake ...		18	Lance	395				20	Urania	833									
20	Skipjack		18	Sainte-Barbe ...	430				20	Saetta	395									
20	Spanker		18	Salve...	406				23	Agordat	1292									
20	Speedwell... ...		18¾	Léger	509				23	Coatit										
19	Alarm		18½	Lévrier	497															
19	Antelope		21½	Casablanca ...	974															
19	Circe...		21½	Cassini	966															
19	Hebe...		21½	D'Iberville ...	952															
19	Jaseur		23	Dunois	889															
20	Jason...	810	23	Lahire																
19	Leda																			
19	Niger																			
19	Onyx																			
19	Renard																			
20¼	Speedy																			
19	Dryad																			
19	Halcyon	1070																		
19	Harrier																			
19	Hazard																			
19	Hussar																			
	31 ships.			21 ships.			9 ships.			15 ships.			3 ships.						2 ships.	

EFFECTIVE FIGHTING SHIPS, BUILT AND BUILDING.

Class.	Great Britain.			France.			Russia.			Italy.			Germany.			United States.			Japan.		
	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.
Battleships—																					
1st-Class . .	32	11	43	11	6	17	8	7	15	2	4	6	12	8	20	10	9	19	6	..	6
2nd-Class . .	11	..	11	10	..	10	10	..	10	8	..	8	..	..	..	..	..	..	..	..	..
3rd-Class . .	8	..	8	15	..	15	4	1	5	2	..	2	15	..	15	7	4	11	1	..	1
Cruisers—																					
1st-Class . .	20	18	38	3	11	14	3	..	3	2	1	3	3	3	6	2	11	13	6	..	6
2nd-Class . .	36	2	38	11	4	15	10	3	13	3	..	3	6	..	6	3	..	3	4	..	4
3rd-Class . .	57	8	65	27	..	27	4	4	8	14	..	14	9	10	19	12	6	18	11	3	14
Total Cruisers .	113	28	141	41	15	56	17	7	24	19	1	20	18	13	31	17	17	34	21	3	24
Torpedo-Gunboats .	31	..	31	21	..	21	9	..	9	15	..	15	3	..	3	..	..	..	1	1	2

CHAPTER IV.

SUBMARINE CABLES.

The Policy of British-owned Cables.

For a number of years the British control of the submarine cables of the world has been steadily increasing. Just as we took the lion's share of the world's shipping, without distressing ourselves over the fact that two-thirds of British shipping never trades to the United Kingdom at all, so we monopolised the cable communications of the world without any qualms whatever about landing on foreign soil. From the point of view of a government constantly at war, it gave us, wherever the cable touched a point along our 43,000 miles of coast line (by far the largest of any nation in the world), an opportunity to establish a censorship, as was done at Aden during the late hostilities, over all European communications to South Africa. It may have been unwise, having a giant's strength, to use it like a giant. The German authorities had to issue notices that messages to German East Africa should be framed in English to pass the censorship at Aden. This shows the strength of a position created by laying cables on the lines suggested by commercial development, as distinct from mere sentiment, which has inspired the policy designated as the all-red or all-British policy. The latter involves no landing points on foreign territory, and had it attained an ascendancy at an earlier date than 1896, it would have nipped in the bud the monopoly we now possess through owning 80 per cent. of the world's cable communications and 31 out of 44 of the world's cable ships. We should not then have found both the Russian and German Governments coming to a British company to link Port Arthur and Kiaochou to a British-owned cable system, as has lately been done. As an indication of the value of that monopoly we may quote the report of the French Budget Commission of 1896:—*

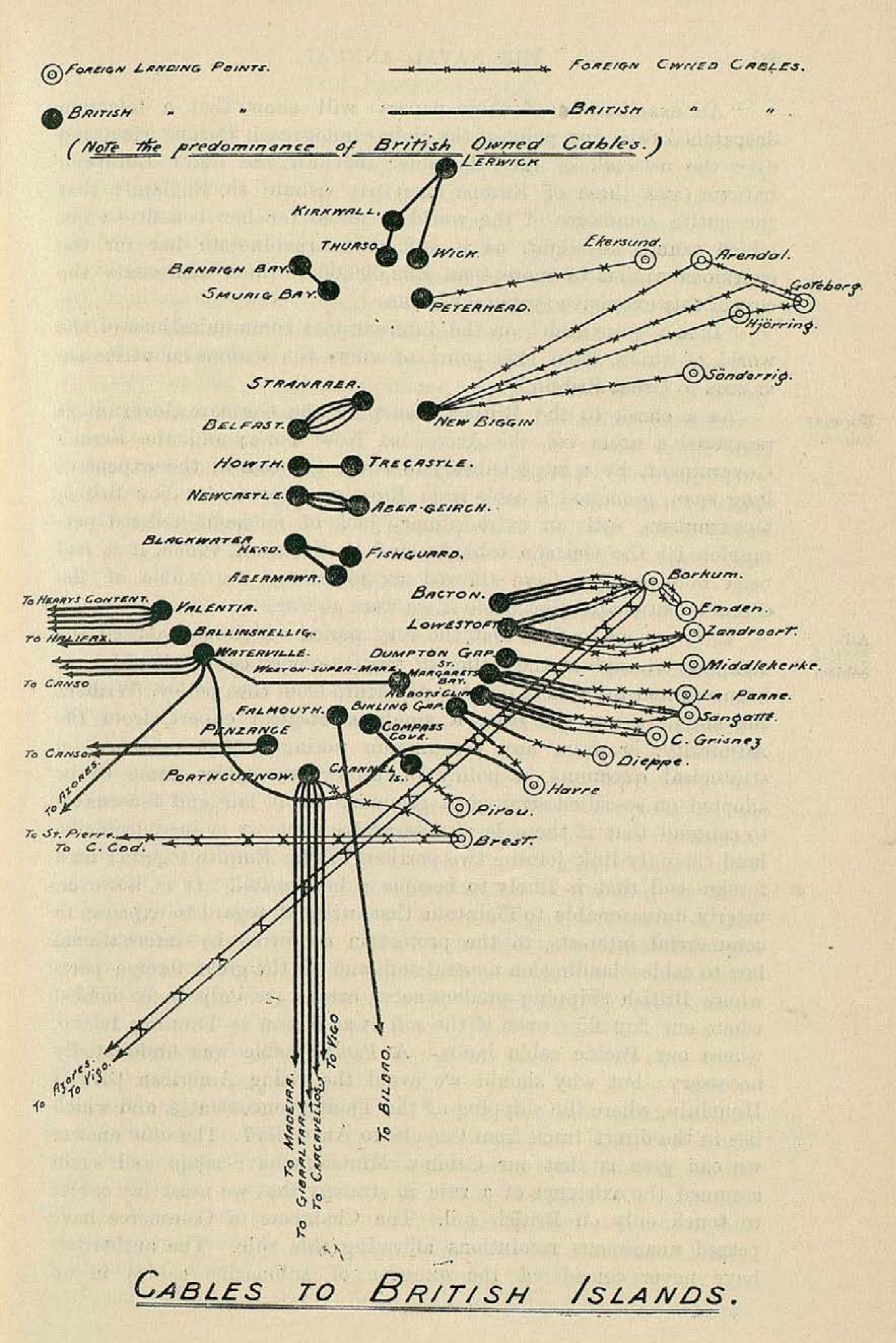
"We have laid before the Budget Commission a map showing the international telegraph lines, which indicates that all parts of the world are, as it were, caught in a net, of which London is the centre.

"Not wishing to make the present report too tedious by long quotations, we give as appendices the following:—

"(i) A list of cables crossing the North Atlantic.

"(ii) A recently published list of the principal submarine telegraph cables of the world.

* Taken from a translation in the *Electrical Review*.



CABLES TO BRITISH ISLANDS.

"An examination of these papers will show that a telegram despatched from any point of the globe cannot reach Europe excepting over the network of English cable; that all the extra European nations (and those of Europe also) pay tribute to England; that the entire commerce of the world is taxed for her benefit—a tax which cannot be slight, as it suffices to remunerate her for the enormous capital of more than £32,000,000, which represents the cost of this extensive system of cables.

"It is a 'pure grab' on the international communications of the world, of which, from this point of view, the various countries are vassals to Great Britain."

Foreign cables.

As a check to the British monopoly the German Government promoted a cable *viâ* the Azores to New York; and the French Government, by a large subsidy to cover the cost of the expensive long span, promoted a cable from Brest to Cape Cod. The British Government, with an extraordinary lack of foresight, refused permission for the German cable to land in Cornwall, which, if it had been done, would have allowed us to censor the whole of the communications by that cable if we were at war.

All-British cables.

It is curious to find that the very period which had marked the complete triumph of the policy of British-owned cables should have been selected for a most notable departure from that policy. Without the slightest support from a single strategical expert, from the Admiralty, or from any commission taking expert evidence on strategical questions, a policy of all-British cables came to be adopted on so-called strategical grounds. It is fair and reasonable to contend that if there is no alternative cable, it is inadvisable to land the only link joining two portions of the Empire together on a foreign soil that is likely to become a hostile soil. It is, however, utterly unreasonable to maintain that, without regard to expense, to commercial interests, to the protection conferred by international law to cables landing on neutral soil, and to the great foreign ports where British shipping predominates, cables are only to be landed where our flag flies, even if the soil is as barren as Fanning Island, where our Pacific cable lands. A Pacific cable was undoubtedly necessary; but why should we avoid the rising American port of Honolulu, where the shipping of the Pacific concentrates, and which lies in the direct track from Canada to Australia? The only answer we can give is that our Cabinet Ministers have again and again assumed the existence of a rule in strategy that we must lay cables to touch only on British soil. The Chambers of Commerce have passed unanimous resolutions affirming this rule. The authorities have never considered the question of submarine cables in an

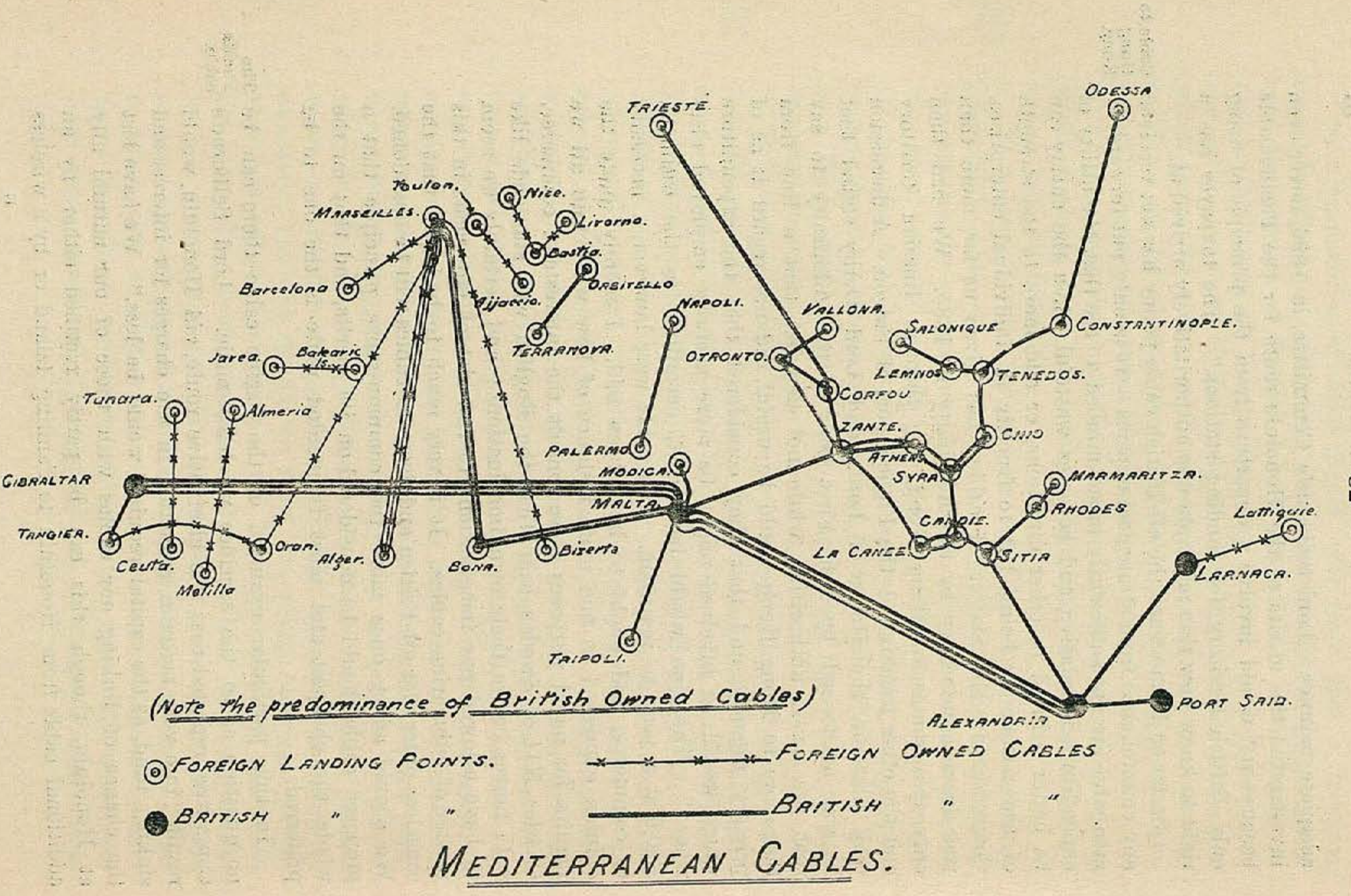
adequate manner. Lord Selborne's Committee, in 1896, never even investigated the merits of the Honolulu route for the Pacific cable because it "would involve a departure from the principle of using only British territory for landing stations." The taxpayer has a right to know how this principle was authoritatively arrived at.

Cable to Hong Kong.

So far as I am aware, the all-British cable policy has not received any countenance from strategical experts. It is only put forward by men who are not sufficiently broad-minded to see that the utility of expenditure is relative, and becomes wasteful when the outlay can be better utilised in other directions, or add more to the strength of the nation by being left to fructify in individual enterprises. Commerce, in the matter of cables, has given us far more than was deemed necessary by the Admiralty in 1885. We had then only two routes to Hong Kong, one through Russian territory and the other touching at the French port of Saigon. A discussion took place in the House of Lords, and Lord Derby stated that he was authorised by "the First Lord of the Admiralty to say that the naval authorities, while not denying that a line from Singapore to Hong Kong would be useful, did not regard it as of primary urgency, and that they considered that the expenditure which would be involved might be more usefully employed elsewhere." The line would have cost, according to the estimate, £20,000 a year to maintain. The cable was, however, a necessity to commerce, and ought to have been laid. I merely quote the opinion expressed as one more instance of how we obtain all we require for naval purposes if we consult the interests of commerce. Charles XII of Sweden said that the English will stampede like wild horses before their own imaginations; and certainly we seem to have allowed our imaginations to run riot of late years in this matter of submarine cables. It is very much to be hoped that the senseless outcry for all-British and deep-sea cables will be abandoned. We should adopt once more the common-sense principle that a proposed cable should be considered on its merits, and that on the whole the cheapest and most frequented route is the one to be preferred.

The Pacific cable.

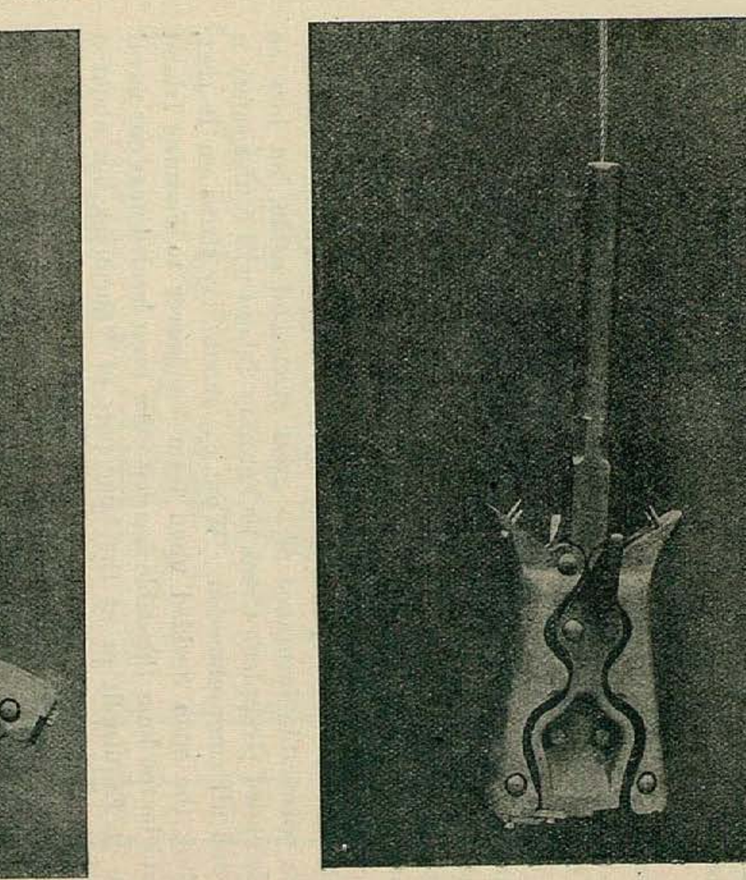
In this particular example of the Pacific cable there can be no question as to the sacrifice we have made. Lord Selborne's Committee reported that the alternative route, *viâ* Honolulu, would result "in a very material reduction in the charges for interest and sinking fund, as the capital required would be less." We have lost the chance of linking our cables with those of our natural ally at Honolulu, though this can be partly rectified either by an additional cable from Honolulu to Fanning Island or by a wireless



MEDITERRANEAN CABLES.

installation. We ought never to contemplate a war with America, but if we do, it is sufficient to say that, in any case, the land lines in Canada could be cut in all directions. The land wire through Vancouver is close to the coast; the existing cable passes just outside the territorial waters of the United States, and again close to Hawaii, and the undefended Fanning Island is only three days' sail from Honolulu and five days from San Francisco. It is characteristic of the piece-meal way in which the authorities deal with these questions, that a variety of aspects were left out of consideration altogether. We need not deal with the cost and nature of any defence of the landing points, Grappler's Creek and Fanning Island, for if an enemy is bent on destroying the cable he can do so more permanently in the deep sea along 7000 miles of its track. It is requisite, however, to mention that these places are without garrisons, settlements, or guns, because some people have an idea that the Union Jack confers safety in itself. A neutral Honolulu, of course, confers safety; and a neutral America, bent on enforcing her War Code that cables going to neutral territory are inviolable, would also be a reasonable insurance of a great stretch of cable, but how an undefended Grappler's Creek or Fanning Island will confer safety is beyond all comprehension. What we should lay stress on is that, finding the span decided upon from Vancouver to Fanning Island would be too long, the cable has not even been landed near our naval base at Esquimalt or at the busy port of Vancouver, but about a hundred miles away. The land wire connecting the cable to the regular system traverses a region of forests where there is not a single white settlement. It has been repeatedly broken through storms blowing down the trees. These breakdowns stop all communications along the whole route, so that the staff are absolutely idle until repairs are effected. For the sake of saving any further waste of money and sacrifice of commercial interests, it is imperatively necessary that naval officers should express their views in clear and emphatic terms. Have we not blindly walked into the old maze of difficulties so familiar in British policy in the past, where, in trying to take care of minor issues, we lose sight of the main issues altogether? In spite of the cutting down of the cable by landing at Grappler's Creek (Vancouver), we have a span 3237 nautical miles long. This cable consequently works at the slow rate of sixteen words a minute as compared with an average of thirty-three words a minute on the Atlantic cables. If we compare the business proposition of a cable from the port of Vancouver to the port of Honolulu, we find the span would have been, allowing the same amount of slack as the existing Pacific cable, 2480 nautical

CUTTING AND HOLDING GRAPNEL (LUCAS' PATENT).



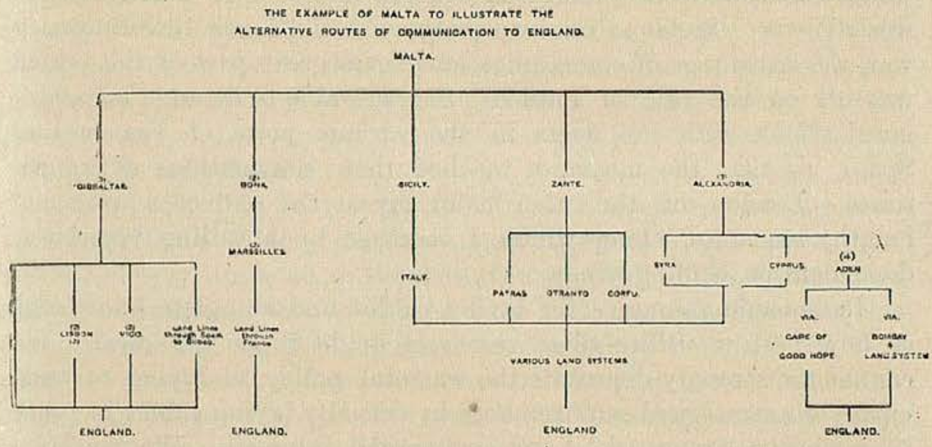
This Grapnel is designed to hook the bight of a cable, to cut and drop one end, and to grip and raise the other end to the surface. It is dragged over the bottom with the folding arms in the position shown above. When the cable has been hooked the bight is raised until it becomes tight, the strain then breaks the bolts that kept the arms extended, the tension on the wire ropes causes the arms to fold down on the shank, securely [illegible] side and cutting off the other.

This view shows the Grapnel when the bolts have been broken, the folding arms grip one end of the cable in the serpentine-shaped space between them and the shank, the knives having closed together and cut away the part of the cable not required.

Telegraph Construction and Maintenance Company, Limited,

miles long, and with a speed very nearly corresponding to that of the Atlantic cables. The cable could have been of lighter manufacture, and therefore easier to repair, and it would have been much less expensive.

It has come about during the last thirty years that the natural requirements of commerce, demanding a multiplicity of routes so as to guard against breakdowns and delays arising from congestion of messages during the business hours in different longitudes, have provided in full for naval requirements. The great naval bases are along the highways of commerce, and the absolute impossibility of isolating a place like Malta (*vide* diagram), with ten cables, from telegraphic communication with the outer world, should be patent to even the most hardened pessimist. Hong Kong again, is the fourth largest shipping port in the Empire, and no less than eight Strategy and commerce.



cables radiate from it in different directions. Both strategy and commerce demand that we should link cables as much together as possible, so that if communication is cut off in one direction the message can be sent in another. For commerce this makes telegraphy cheap and reliable where it is most wanted for the purposes of business; for strategy it ensures communications being within call, so that messages can always be sent. The cables have never been neutralised, and are always at the disposal of our war-vessels except where they go to the enemy's territory.

While two out of three merchant ships on the ocean are British, we have at neutral as well as British ports an unrivalled system of natural scouts. They have traversed the principal ocean routes of the world, and they can render valuable aid in war so long as the central organisation has thought out all the problems connected with information in war in advance. If these plans are not prepared in Information in war.

advance our position, however great our resources, must be similar to that of the French staff in the Franco-German war, yielding credence to the wildest rumours concerning the movements of the German troops. Even cables going to or from the territory of an enemy can be utilised if apparently harmless messages—meaning something quite different—are carefully thought out in peace, and in addition similar telegrams are sent during peace to *bona fide* business firms, so that the suspicion attaching to the "new-comer" will have no application in the case of these war messages.

With good intelligence arrangements the net result of all extensions of communication must be a gain to the superior maritime Power. In building up our vast network of cables, commerce, as in many other instances, was consolidating our naval strength. It can but be a gain to the superior naval Power to add to the means of communication, for the tactics of evasion and secrecy belong to the weak Power. So far as one can judge of the French Revolutionary war, the advantage of communications for a great part of the period was all on the side of France. She was able to arrange her communications with the fleets in the various ports of France and Spain, so that the messages reached their destinations at known times. London, on the other hand, lay at the end of a wide and lengthy sea route, along which a message by a sailing vessel was dependent on baffling winds.

The requisite resources for war.

Reasonable resources for laying cables and complete knowledge of how best to utilise those resources ought to be our ideal. We cannot too strongly deprecate the wasteful policy of trying to anticipate our strategical requirements by actually laying cables in peace time when not required by our commercial interests. We can lay a cable at a speed of seven knots, and even faster in deep water, and so we can well afford to wait until we know where the crisis is to be. We shall find it infinitely more valuable to have a cable in the tank, or a wireless apparatus ready for erection, than if we had actually attempted to lay special cables in peace. In the latter case we might find, when the crisis came, that the cable had been taken to a port where it was not required. No one, six months prior to the last Chinese anti-foreign outbreak, could have anticipated that a cable to Taku would become a paramount necessity. The most we could have urged at the time was that our commercial interests long previously required a cable from Shanghai to Chefoo, and thence from Chefoo to Taku. The latter is the natural port of the densely-populated province around Pekin. If we were not so handicapped by the number of would-be strategists discovering requirements in deep-sea cables and long spans, all-red cables, and out-of-the-way bases which we are assured

"command the surrounding seas," we might long ago have provided for all important cable requirements, and so satisfied the main demands of strategy as well.

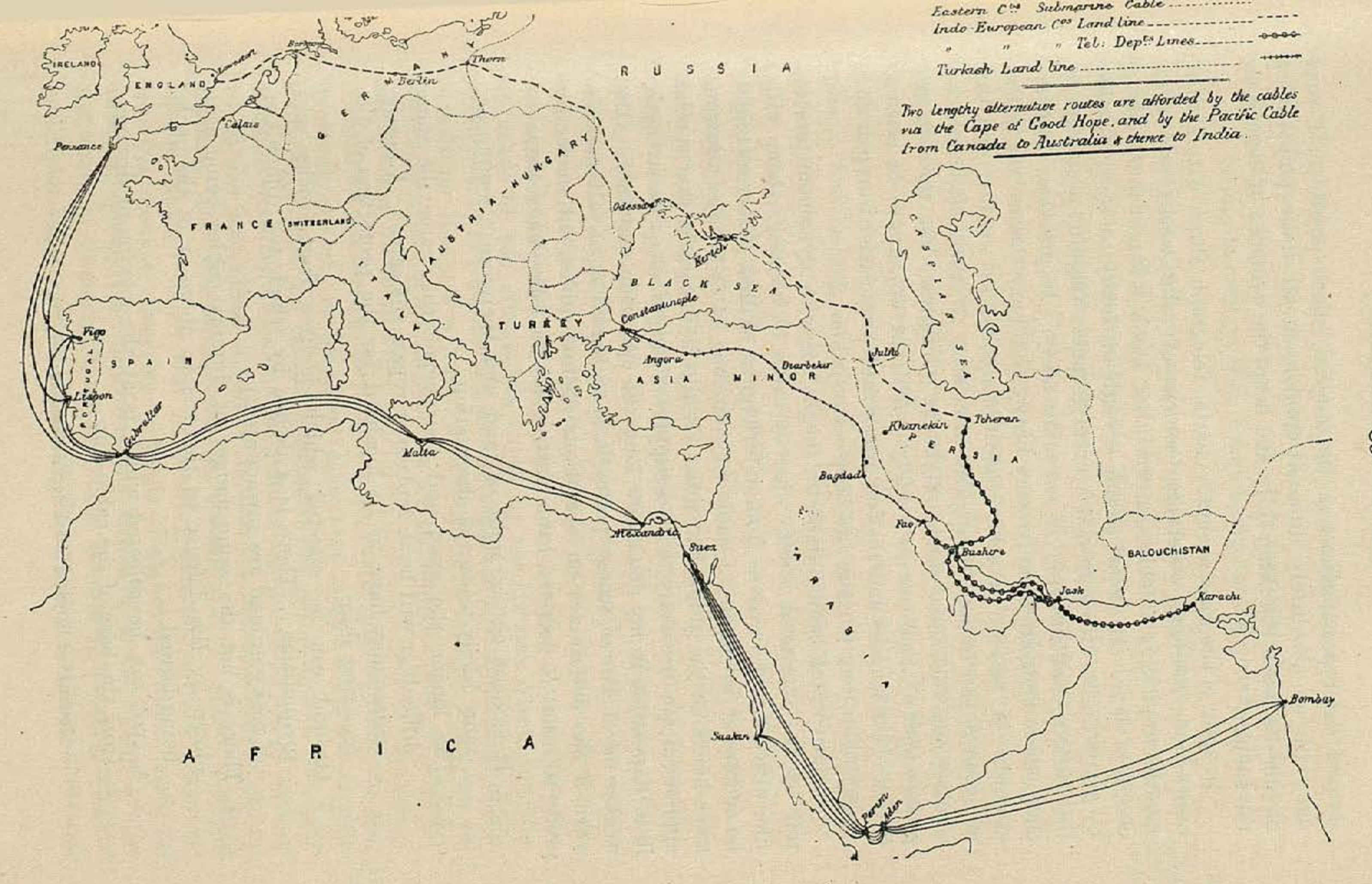
The best policy for the State is to lay cables under British ownership, in conjunction with those already in occupation of the field, where they are required by our commerce, and to follow the cheapest routes, so that the cables become self-supporting as well as real aids to commerce. The greater the grip we get on the cable communications of the world the larger must be the resources maintained for renewals. Cable companies invariably keep small stores of cable in excess of what is required for maintenance purposes. So here again our commercial needs feed our strategical. If the net of natural or commercial cables is spread sufficiently wide, the distance required for a strategical cable ought to be very small. The maintenance stores, sufficiently widely distributed, should then suffice for any cable specially required for war. The length of such an emergency cable should depend on a consideration of what wireless telegraphy can achieve without interference being possible, and on the distance of the nearest friendly landing places possessing two routes of communication. Maintenance stores.

Gutta-percha is only exported from Singapore and the surrounding Dutch islands to the extent of about 6000 tons a year, and the supply limits us to the manufacture of about 18,000 nautical miles per annum. One of the leading cable manufacturers in this country stated at the Royal United Service Institution, in 1900, that there are three leading firms and two small firms in the cable-making trade. In full work they could turn out 100 nautical miles per day. Allowing 300 working days to the year, this would give 30,000 nautical miles per annum; but he did not go into the question of the available supplies of gutta-percha. An additional point to bear in mind is that for war purposes—the duration of war being limited—ordinary india-rubber cables would be quite good enough for our purposes. Supply of gutta-percha.

Just as the best fortifications in the later history of war have ever been the earthworks hastily erected in face of the enemy, so the most useful cable will be the one along a route chosen by the Admiral himself when war is imminent or breaks out. So the strategical cable—or the emergency cable as I should prefer to call it, for the same cable might be utterly useless under different circumstances—followed our Fleet from the Island of Chio to Besika Bay. When the Fleet moved nearer its work the cable followed it to Gallipoli and Constantinople. In the Zula War a cable intended for Australia came in handy for Durban. When Port Hamilton became a natural base of operations for our China Squadron, to Emergency cables best.

prevent Russia from seizing a port in Korea, the cable was sent to Port Hamilton. During the Egyptian rebellion in 1882 the land lines were interrupted. A cable was immediately laid by the Associated Submarine Telegraph Companies from Alexandria to Port Said and land lines taken along the banks of the Suez Canal. When Alexandria was bombarded a vessel was anchored out at sea and the cable ends were taken on board, so that the Admiralty were in constant communication with the Fleet. It is easy to lay a cable along a properly surveyed route, with soundings every ten to fifteen miles. Surveying the routes which might be required in war is, therefore, one inexpensive way of preparing for the future. As these routes lie in the direction of a probable enemy's coast, the survey work will have to be done with due circumspection.

Tactical aspects. Fanciful pictures have been drawn of what is to happen to the cables in war, to which history lends no countenance whatever. Thus the late Sir Samuel Baker, in a forecast of a war with a dual alliance of France and Russia, said: "In a few hours all the submarine cables would be cut, and we should be bereft of telegraphic news from the outside world." A witness before Lord Balfour of Burleigh's Committee rang the changes on a surprise cutting of cables, before war breaks out, in the shallow waters over which cables pass near Gibraltar, Newfoundland, and the Malay States. This extravagant alarm is similar to the oppressive vision of Dr. Jules Guyot, who thought that some "good-for-nothing fellows" might cut all the wires of the chief cities, and so paralyse the civilisation of the world! Cutting telegraph wires is certainly feasible, whereas the talk about cutting *all* the submarine cables is sheer nonsense. The secret policy of the Government in pigeon-holing reports of the most instructive kind, so that not even naval and military officers have access to them, is responsible for nearly all the wild talk about submarine cables on which the public have been fed of late years. We now know from Sir George Clarke, who was a member of the secret committee of experts formed in 1891, that the report of that committee, had it been made public, would have given us the common-sense view concerning submarine cables. It arrived at opinions adverse to the modern ideas of all-British cables, deep-water routes, and lengthy spans. This is the only committee which had considered the strategical aspects of cables up to the appointment of Lord Balfour of Burleigh's Committee in 1901. The advantage of going into the matter thoroughly is shown by Sir George Clarke's description of his own position. "I went into that Conference," he said, "with a sort of general idea that a cable was of no use unless it never touched anywhere except on a British shore, that it ought to be laid in the



DIRECT TELEGRAPH ROUTES TO INDIA.

deepest water possible and in the longest length possible. I came out with an absolutely different opinion on all these points after having discussed the thing fully and heard the evidence of experts on the subject."*

Cutting and repairing cables.

In spite of the most accurate charts, telegraph ships, with skilled crews and life-long observers, sometimes take weeks and even months to pick up a cable; on the other hand, it might take only a couple of days. It seems simple enough in theory to sever a cable by grappling it with a special kind of grapnel, weighing a cut end to the surface and carrying it ten miles away. In practice, however, the inshore ends are usually very heavy and bury themselves in the ground. A variety of other conditions, such as weather and the monsoon in the Indian Ocean, also interfere. If the route could be a secret one additional safety might be conferred; but there is no route which of itself can give safety. All that appears to be certain is that short lengths and shallow-water cables are easier to repair and replace than long lengths and deep-water cables.

A deep-water cable might be sought for with dynamometers to tell by the increased strain when a cable is hooked; then, with fine weather and freedom from interference, skilled observers might be successful in cutting a cable in from one to two days, allowing some hours for the grapnel to sink. While it is certain that special appliances are necessary, with a supply of wire of adequate strength, it is impossible to lay down how long the operation may take. The weaker naval Power, whose policy it is to harass us in all possible ways, if she determines on operations against cables, will naturally prefer to resort to deep-sea cable-cutting, for the following reasons:—

1. It is done out of sight of land, and therefore attempts are more likely to escape observation.
2. The longer the span and the deeper the water the more difficult it will be to replace or repair the cable. A hostile cruiser may have to be localized for the protection of the repairing ship.
3. Ground can be selected which is free from rocks and inequalities. (There is a device by which the difficulties of rocky ground are surmounted.)
4. There is not the same danger of dummy cables being laid down by the defence as there is in shore or of the cable being buried.
5. A spot can be selected which is at the maximum distance from the base of the cable-ship.

* Journal of Royal United Service Institution, Dec., 1900.

6. The cables are always made much stronger and heavier inshore to resist friction, anchors, &c.
7. Inshore there is always a risk of unchartered dangers, and, if boats are used, of their crews being annihilated by rifle-fire.

The instance given by Lord Carnarvon in the House of Lords, April 14th, 1885, of Russian volunteer ships being fitted to cut our cables in 1878 is quite conceivable. The fewer the cables the greater the reward of enterprise against them, and our cables were few and far between in 1878. Communication was frequently interrupted by ordinary breakdowns. Again, to fit vessels to grapple and cut cables does not detract from their fighting capacity. To devote them to that object is, however, a different matter, for it becomes a question whether they can be used for better purposes. Especially must this view of the case present itself to the weaker naval Power, which perforce resorts to the tactics of evasion. A waste of effort over an arduous undertaking, which, if observed, may lead to a vessel's capture, should be a subject of rejoicing to us rather than of alarm in the event of an enemy attempting it. As for Great Britain, except where the cables may be a source of annoyance in telegraphing the movements of our ships where they show themselves on the enemy's coast, we should probably leave the cables alone. Supposing the enemy's fleet is divided into two portions, and our own occupies the interior positions between them, it might be our object to isolate them from telegraphic communication with each other. In many cases it is a matter for careful thought as to whether the cable should not be left alone for future use. As examples we may cite the use made of the Alexandria cable by the British Fleet, and the position of Dewey at Manilla, had he been a British admiral, operating from Hong Kong as a base. The route of a foreign cable can be altered to a base of our own choice on the enemy's coast, or the end can be taken on board ship. The policy of cutting cables.

History has shown that the weaker Power, driven from the sea, frequently resorts to dispersed efforts or what is almost guerilla warfare. With no other alternative at her disposal she may attempt to revive the old cross raiding tactics of centuries ago, in which the immediate objective is not the enemy's force, but the property the enemy desires to defend. It is quite possible that attacks on cables will be no exception to the rule. History, however, cannot show us a single instance in which such an irritating policy has influenced the result of a war except to the detriment of those resorting to it. The attempt to violate strategical principles has even been made by the superior maritime Power, as Historical lessons.

by the Italians at Lissa, but the result is always the same—viz., to affirm the old historical principle that wars are won by concentration of effort in which the objective is the enemy's fighting force. Dispersion of effort is only justified when it brings about a greater dispersion on the part of the enemy. It is difficult to see how any dispersion of effort against our submarine cables could assist our enemies. It is a tedious operation even with the command of the sea, and so far as half a century of submarine telegraphy can teach us anything, operations against cables have only been attempted by a Power when there is but little prospect of interference. The only instances known to the writer of the weaker naval Power cutting cables were some trumpery successes on the part of the Germans in the Franco-German War of 1870–1. They had the wisdom not to try and interfere with the cables to England, which gave them so much useful information of events in France. In the Chilian-Peruvian War, the Huascar tried for two days, in shallow water at Antofagasta, to sever the cable to Valparaiso. The officer in charge had himself assisted to lay this cable, but picked up the cable to Iquique and severed that by mistake.

The American-Spanish War.

With all the admirable conditions of weather in their favour the Americans failed to sever the communications of Cuba, which were maintained from the beginning to the end of the Spanish War, but they had not got special appliances. There can be but one opinion on these operations: they were undertaken by America to the detriment of her own position. The fast scout, St. Louis, might have rendered great and lasting service by watching Cervera's squadron in the Canary Islands, but she was employed in attempting to sever cables, mostly old disused ones, which her captain imagined were the communications of Cuba with the outside world. When he had severed what was believed to be one of the cables from Santiago to Jamaica, he possessed no certain knowledge as to whether there was a second cable! No clearer idea seems to have inspired the cable tactics than was the case with the bombardments. It was through the failure of the cable-cutting tactics that Cervera received his instructions consigning the Spanish squadron to its certain doom at the action of Santiago; and the whole military operations of the Americans were brought to a standstill owing to movements of cruisers whose operations were shrouded in secrecy owing to their avoiding the telegraph. Various claims of destroying cables were made. Apart from coastal communications, the only certain claim was that of the French cable to Haiti. This might have been done, and the general purposes of the war better served, had the Americans at the

beginning of the war followed the precedent of Vernon's expedition, by occupying Guantanamo where this French cable happened to land. A few days after it had been cut, Admiral Sampson had it repaired for fear of international complications. The cable had been cut outside territorial waters, and as it landed on neutral territory the United States, with that scrupulous respect which they have always shown for right dealing, rectified the blunder. After the war compensation was paid for the cables cut. The net conclusion appears to be that, if a policy of cable-cutting was one of doubtful expediency ten years ago, each succeeding year which has multiplied the routes has made the policy even more doubtful. As matters stand to-day, it is unlikely that a single portion of our Empire, save some unimportant islands, will be isolated during war with any European Power.*

Marconi system.

It is impossible to consider the tactical aspects of submarine cables without a reference to the future of "wireless" telegraphy. At present the system most prominently before the public is the Marconi, which has successfully sent "wireless" messages from ship to shore up to 2000 miles and from Poldhu (U.K.) to Cape Cod (U.S.). In response to my queries, the Marconi Wireless Telegraph Co., under date Jan. 27, 1903, offer to guarantee the following:

(i) Messages between their stations cannot be tapped.

(ii) Messages between two of their stations will not interfere with other stations controlled by their company.

(iii) Messages will not be interfered with by any ordinary atmospheric disturbance.

In developing his argument, the manager states that "we can work simultaneously two differently tuned instruments, placed side by side, and connected to the same aerial wire; messages being correctly received on two similar instruments attached to a second aerial wire or each attached to a different aerial wire at the receiving station or stations."

The Admiralty work the untuned system, and complain of interference from the Marconi stations. This fact shows the necessity of a thorough investigation of the whole question with the view to the standardisation of systems. We, as a nation, have everything to gain in commerce and war by cheap and reliable communications, but

* The following is a list of British possessions not telegraphically connected with Great Britain:—Amirantes Islands, Andaman Islands, British New Guinea, Chagos Islands, Christmas Island, Cook or Hervey Islands, Diego Garcia Island, Falkland Islands, Laccadive Islands, Labrador, Maldive Islands, Penrhyn Island, Pitcairn Island, Santa Cruz Islands, Socotra, Solomon Islands, Somaliland, Suwarrow Island, Tristan d'Acunha, and seven of the islands in the West Indies.

the present system of *laissez-faire* as regards wireless telegraphy means something like chaos as regards many uses it can be put to by a maritime Power. An international conference to promote common action has become a necessity, such a one as would adjourn from year to year until the new system has settled down into well-ordered channels. There is a balance of advantage in this country taking the initiative in the matter and promoting a conference in London.

International Law and Censorship.

It may be conceded at once that the weaker of two Powers is the least likely to infringe the spirit of international law. What, then, is our position, and what have we to fear from our probable enemies? We are certainly justified in basing our arguments on the assumption that we shall be the superior maritime Power. The Duke of Devonshire, as head of the Cabinet Committee of Defence, has recently declared that "the maintenance of sea supremacy is the basis of Imperial defence against attack over the sea. This is the determining factor in fixing the whole defensive policy of the Empire." Then we may assume, if certain principles can be derived from international law, those who are opposed to us are unlikely to offend neutrals by violating those principles, since they have already undertaken a task which is too great for their naval strength. International law regarding the cable as private property recognises the right to cut it in the belligerent's territorial waters. If the cable goes direct from coast line to coast line of the belligerent, then, and then only, can it be cut all along its length. Thus, to take a specific instance, the all-British Pacific cable can be cut along the whole 8272 miles of its length, for no question of neutral property comes in. Had the cable, however, been taken along the shortest track and landed at Honolulu, so as to follow the shipping route from Canada to Australia, then, Honolulu being American territory, it would not be open for any European Power at war with Great Britain to cut the cable except within three miles of the British landing points. This principle was directly affirmed in the policy of the United States during the war with Spain, and it is now officially incorporated under the signature of the President in the United States Naval War Code. Article 5 of the Code is as follows:—

The following rules are to be followed with regard to submarine telegraphic cables in time of war, irrespective of their ownership:—

(*a*) Submarine telegraphic cables between points in the territory of an enemy, or between the territory of the United States and that of an enemy, are subject to such treatment as the necessities of war may require.

(*b*) Submarine telegraphic cables between the territory of an enemy and neutral territory may be interrupted within the territorial jurisdiction of the enemy.

(*c*) Submarine telegraphic cables between two neutral territories shall be held inviolable and free from interruption.

The fact that cables have never been neutralised, on the one hand, allows a belligerent to establish vexatious powers of censorship, and, on the other, allows warlike messages to pass over neutral territory. The Submarine Cable Convention (Paris, March 14, 1884) contains no provisions for the neutrality of the cable. The British Government, as at the Peace Conference at the Hague, have always refused to agree to any proposal for neutralising the cables. This non-recognition of neutrality extends to any repairing ship employed about cables in the enemy's territorial waters. The American admiral in the Spanish-American War was perfectly within his rights in warning the Grappler that an attempt to repair cables would be considered an act of hostility. As regards censorship there appears to be only two alternatives. The first is the method of the velvet glove, the second the iron hand. By the first we allow everything to pass through. We make the cable companies our allies, and we ask them to give us the benefit of their advice as to "the new-comer" along the line. The traffic superintendents can easily recognise "the new-comer," and to allow him plenty of rope is the most certain way of finding out what is passing. The irritating restrictions at Aden during the last war were of little real use from a military point of view, and did a great deal of indirect harm. The method of the iron hand, seldom to be resorted to but sometimes necessary, allows none but war service messages to pass. Then we have absolute certainty that no information is being given. The restriction must last until danger is no longer apprehended from information of what has taken place leaking out. Before resorting to such an extremity we must be very sure that the end justifies the means.

Censorship.

A further point which has to be considered is the position of submarine cable vessels in war. We shall require them at hand on the important stations. The question has therefore to be faced as to their freedom to transfer their flag prior to the outbreak of war. When the cables mainly go from British to neutral territory, there is a balance of gain in such a transfer, as the vessel cannot be seized when repairing cables outside our own territorial waters. On the other hand, their services may be of great value to us in war. It is one of those cases in which it is better for the Government to consider the matter during peace, and to reach a secret working agreement with the great cable companies.

The position of repair ships.

The use of cables and ciphers.

We feel strongly that, so far as the Navy is concerned, the telegraph is a good servant but a bad master. Under many circumstances of war it is the unknown threat which paralyses the enemy's actions, as when Richery hesitated to sail for a long time, and then wrote that the British Fleet had at last come in sight, and he would sail that night. To dangle at the end of a telegraph cable when it is unnecessary to do so is to give hostages to fortune. Generally speaking, it is the worst piece of folly an admiral could be guilty of, either before or after the outbreak of a war. The idea of stationing powerful cruisers for the defence of commerce at telegraphic centres is only justified if the enemy are unusually foolish. No amount of censorship, short of stopping private messages altogether, can prevent apparently harmless messages giving information to an enemy. An admiral has all he requires when messages can be sent in from time to time in cipher and if necessary by a reliable form of wireless telegraphy. So long as a cipher is a good one and is changed often enough there is little risk of detection. For the purposes of naval war a month's guarantee of secrecy would be ample. We ought not to be so foolish as to allow our wireless messages to be tapped, using an easy cipher, as was the case in the Naval Manœuvres of 1901, nor should we fail to change the cipher from time to time. Recently a comparison was drawn to the Confederates in the American Civil War; but surely there is no comparison between a Power which should think out everything in advance and a rebellion where everything had to be improvised in face of the enemy. In addition the question is one of time. While information a fortnight old is often of the greatest use in military war, it is seldom that this can be the case in naval war. There is, however, room for inquiry about the matter, in order to find out what this time limit is likely to be. The Napiers discovered Napoleon's cipher, but it was not discovered during the Peninsular War. All we know is that if a sufficient number of messages can be obtained, and the enemy is aware of the general nature of their contents, there is a danger of a cipher being discovered in time. In a thoughtful and interesting speech Mr. R. K. Gray, an acknowledged expert, said: "It is almost certain that the ciphers of every Foreign Office in Europe are easily translated by other interested Powers, and I expect with the other departmental codes the same thing exists. Several official messages sent during the present war have passed through my hands. In some of them a system of half code, half plain language is used. The deciphering of this class of message is child's play. The best secret language I know is that evolved by the Wheatstone cryptograph." The Foreign Office cipher is an

elaborate dictionary, and those responsible for our foreign relations are, I am assured, utterly sceptical about Mr. Gray's contentions. Only recently I had a cipher explained to me which would defy detection.

The conclusion which emerges from this brief survey of the situation is that we should do nothing to undermine the British monopoly of the cables of the world, which countless foreign telegrams have contributed to build up. We have no need of expensively laid cables when they are useless commercially, and where they are in no sense vital necessities to the offensive action of our mobile forces in the brief interludes of war. We are always waging an acute industrial conflict from which we extract a revenue to maintain the burden of armaments; and it is to the interest of our system of defence to lighten that burden wherever we can do so with safety. Successful military warfare is a matter of the organisation and training of our mobile forces; and cables, like bricks and mortar on shore, play a necessary but very subordinate part. About forty separate cables were recommended by witnesses before Lord Balfour of Burleigh's Committee two years ago! Expenditure on such cables, which could have been devoted to our mobile forces, is an evil to be avoided if possible. There is no more foolish strategy than that of the alarmist who tries to occupy the whole theatre of war and to provide for all war's possibilities, such as cable cutting, affecting surprise at the discovery of risks in the dangerous trade of war. The wise statesman takes care of the main issues, providing for the *probable* situations, knowing full well that dispersion of effort in strategy can paralyse the strongest forces, and in our war policy it would lead to national bankruptcy. Conclusion.

CARLYON BELLAIRS.

Reference Table.

(The word mile is used here for nautical mile.)

Record speed of cable making. . . .	52 miles per diem, but a general average speed of cable making is 28 miles per diem.
Output of cable-making companies in United Kingdom, allowing for existing supplies of materials.	18,000 miles per annum if gutta-percha is used, but in war we could use inferior materials such as india-rubber.
Average speed at which cables are laid .	7 miles and faster in deep water.
Speed of coiling cable in cable-ships . .	5 miles, using two tanks.
Slack allowed in laying cables. . . .	10 per cent., *e.g.*, a distance of 1000 miles requires 1100 miles of cable; but in practice the cables are often laid with less slack—15 per cent. of slack is taken in the cable-ship.
Longest span of cable among existing submarine cables.	Grappler's Creek (Vancouver) to Fanning Island, 3237 miles.
Length of submarine cables of the world.	214,000 miles (22,850 being government owned).
The world's cable-ship fleet	44 vessels (31 under British flag).
Greatest depth at which a cable has been laid.	Grappler's Creek to Fanning Island, 3407 fathoms.
Cost of submarine cables of the world .	About £46,000,000, of which £12,000,000 is government owned.
Average life of a cable	25 years; though cables are still working with a life of over 30 years. No guarantee is ever given.
Greatest depth at which repairs have been effected.	About 2500 fathoms.
Greatest length at which messages have been sent experimentally.	4733 miles.
Average length of code words	8 letters.
Speed of cables	16 words a minute (of 5 letters each) on All-British Pacific, and 44 words a minute on some Atlantic cables.
Highest speeds attainable	30 words a minute (of 5 letters each) by ordinary instruments with hand manipulation, and this is increased by automatic system (without duplex) to 50 words a minute.
Increase resulting from duplex (depends entirely upon the length of the cable, and the adjustment of the receiving apparatus).	About 80 per cent.; as much as 200 words per minute have been recorded.
Formula for speed of cabling	Speed varies inversely as the square of the length for the same cable, thus: If 500 miles gives 120 words a minute, 1000 miles gives 30 words a minute, 2000 miles gives 7½ words a minute. Given equal weights of copper and gutta-percha in each case, we can get the same speed for a length A, which is twice as long as a length B, if we make the core weights of length A twice as heavy as length B. Again, if length A is three times as long as length B, to get the same speed we must make the core weights of A nine times as heavy as B.

Amount of cable from ship to where it touches bottom, laying cables in 3000 fathoms.	Depends on speed of laying, but may be taken as 20 miles.
Weight of moderate-sized cable that can be supported in sea-water without breaking on grappling.	9 miles, or 4½ miles on each side of the grapnel, with a new cable.
Strain put on a cable in lifting bight for repairs in moderate weather from a depth of 3000 fathoms.	About 6 tons, but strain depends upon the height that the bight is lifted.
Breaking strain of largest cables—the Valentia-Newfoundland Cable of 1894.	8½ tons, when new in 1894, but less as it gets older.
Weight of Valentia-Newfoundland Cable of 1894.	2·01 tons per mile in air; 1·13 tons per mile in sea-water.
Strength of wire-rope required to use with a grapnel or ordinary anchor, steaming ahead ½ knot to cut enemy's cable.	Depends on depth, but rope must be at least three times as strong as cable.
Lengths of cable on the Eastern Extension Telegraph Company's All-British Cape to Australia route.	Durban to Mauritius, 1717; Mauritius to Rodriguez, 404; Rodriguez to Keeling, 2151; Keeling to Perth, 1714; Perth to Glenelg, 1545 miles. Total, 7531 miles.
Length of cable on All-British Pacific Cable to New Zealand and Australia, reckoning from Grappler's Creek to North Cape in New Zealand and Brisbane in Australia.	8272 miles.

Some Causes of Breaks.

Insect Life.—These swarm in about 30 to 70 fathoms, and are known to have caused breaks in cables at 800 to 900 fathoms. In most exposed parts the cables are covered with a brass tape covering to protect them from insect life.

Fish Bites.—The Eastern Telegraph Companies in their evidence before the Pacific Cable Committee stated that breaks had been caused by fish bites. On two occasions the carcase of a whale has been found entangled in the cable.

Volcanic Action.—The Eastern Telegraph Companies have had their cables interrupted on several occasions by volcanic action, landslips and earthquakes. Three of the Australian cables were simultaneously interrupted in this way.

Bonfires on the Beach.—Interruptions of subterranean ends of cables have been caused by bonfires.

Corrosion.—Weakening the strength of a cable, and preventing it from being lifted for repairs. This has been largely got over by taping and compounding each wire.

Ships' Anchors.—Picking up cables. This is arranged for by making cables specially strong in shallow water. The weight in air may run up as high as 20 to 28 tons per mile. The companies readily pay compensation to fishermen losing their anchors in this way; and, as far as possible, the shore ends of cables are protected by prohibiting vessels from anchoring in their vicinity. No less than 13 anchors were picked up once in a four-mile length of cable in the Firth of Forth.

Friction.—This causes breaks chiefly on rocky shores and in strong currents. Generally speaking, in the tropics the decayed marine life—except for coral reefs—makes a soft bed, and even covers the cables with a thin layer. This marine life does not exist in cold water. In the cold regions the icebergs, too, bring down embedded rocks, which are deposited on the ice melting—so forming a rocky bottom.

CHAPTER V.

Naval Works.

The growth of the Navy, the increase in the dimensions of ships, the desirability of rendering certain ports secure against torpedo attack, and the necessity of providing additional accommodation for the increasing *personnel*, combined to make a demand on the Works Department which would have entailed a very heavy charge in the ordinary votes. The advisability of providing for the cost of new naval works by a Loan Act was discussed in the House of Commons on April 9, 1895. Sir William Harcourt pointed out that the question was fought out in 1862 when the Fortifications Bill was brought in. "Those fortifications at that time were thought to be very valuable, and everybody now admitted the fortifications to be practically of no use whatever; therefore, if any obligations had been imposed on future governments they would have been compelled to spend millions on works which would have been totally useless." We have two signal instances of works undertaken for naval purposes, and which were subsequently recognised by Parliament as useless, in the expenditure on the Alderney Breakwater and on the Wei-Hai-Wei Barracks under a Military Works Bill. The usual experience is that the original estimates are largely exceeded, and that the arguments favouring the expenditure might have been reconsidered had the House of Commons been in possession of trustworthy figures. It is, for instance, difficult to believe, when round sums like a million sterling are estimated for the total cost of both the coaling facilities at Simon's Bay and the breakwater at Malta, that the estimate is based on anything else than mere conjecture. A similar criticism applies to the expenditure of £2,500,000 on Simon's Bay Dockyard extension. It should also be remembered in considering what has been called the brick-and-mortar policy that a large annual expenditure is steadily incurred under the regular Naval Estimates for building slips, shops, torpedo and rifle ranges, dredging, and

coaling depôts. Under this head the expenditure at the Falkland Islands alone has been very considerable.

As regards the majority of foreign dockyards, the old policy of obtaining docks by subsidies was probably the wisest. In this way we have obtained graving docks of large dimensions at Esquimalt, Halifax and Hong Kong, and one is being built at Colombo. In the statement of the First Lord, explanatory of the Navy Estimates 1887–88, it was stated that "the conditions under which Government assistance towards the construction of docks is given is that when constructed payment shall only be made for services or work rendered." In 1890 the Admiralty contemplated obtaining a dock at Gibraltar in the same way.

In 1894 expenditure on naval works was foreshadowed by the First Lord in the annual statement explaining the Navy Estimates. The reason given was that "the increase of our ships in size and number necessitates an increase of dock accommodation, and the development of modern naval warfare makes it necessary to find additional anchorage for our fleets where they will not be exposed to the danger of torpedo attack."

Naval Works Act, 1895.

The Naval Works Bill of 1895 was introduced by the Board of Admiralty over which Lord Spencer presided, and was passed by Parliament, Mr. R. W. Hanbury's amendment to substitute the word "docks" for "dock" at Gibraltar being accepted by the Civil Lord, Mr. Robertson, on the ground that "it would increase the power of the Government to plan the first dock in such a way that others could be added."

Five years was the limit for the completion of the Liberal scheme for Gibraltar. It is because that scheme was unnecessarily extended that the works are not complete yet, and Mr. Arnold Forster at the time complained that five years was too long. The House was unanimous, even Mr. Gibson Bowles saying that "they were all necessary and proper works to be made, especially the dock at Gibraltar. A great deal of rubbish had been talked about the danger to which that dock would be exposed in time of war. The dangers to the dock from hostile attack, even from Spanish territory, had been enormously exaggerated."

The expenditure proposed under the Bill of 1895 amounted to £8,806,000, of which £225,000 had already been spent on March 31 of that year, and was classified under the following heads:—

(1). Defence of Harbours against torpedo attack—	£
Gibraltar	974,000
Portland	650,000
Dover	1,920,000

	£
(2). Adapting Naval Ports to present needs of Fleet—	
Deepening Harbours and Approaches	960,000
Keyham Dockyard Extension	1,920,000
Portsmouth Docks	329,000
Gibraltar Dock or Docks	361,000
Hong Kong Dockyard (Extension)	290,000
(3). Naval Barracks	942,000
Walmer Marine Depôt (Extension)	20,000
Keyham Engineers' College (Extension)	30,000
(4). Superintendence and Miscellaneous Charges	300,000

Act of 1896.

In the year 1896, Lord Goschen having succeeded Lord Spencer as First Lord of the Admiralty, a second Naval Works Act was passed, which authorised an expenditure of £14,040,000, a very large increase over the expenditure authorised in the previous year. The principal items of increase were:—Gibraltar Dockyard, £2,674,000, as compared with £361,000; Keyham Dockyard, £3,175,000, as compared with £1,920,000; and Naval Barracks, £2,217,000, as compared with £992,000.

Act of 1897.

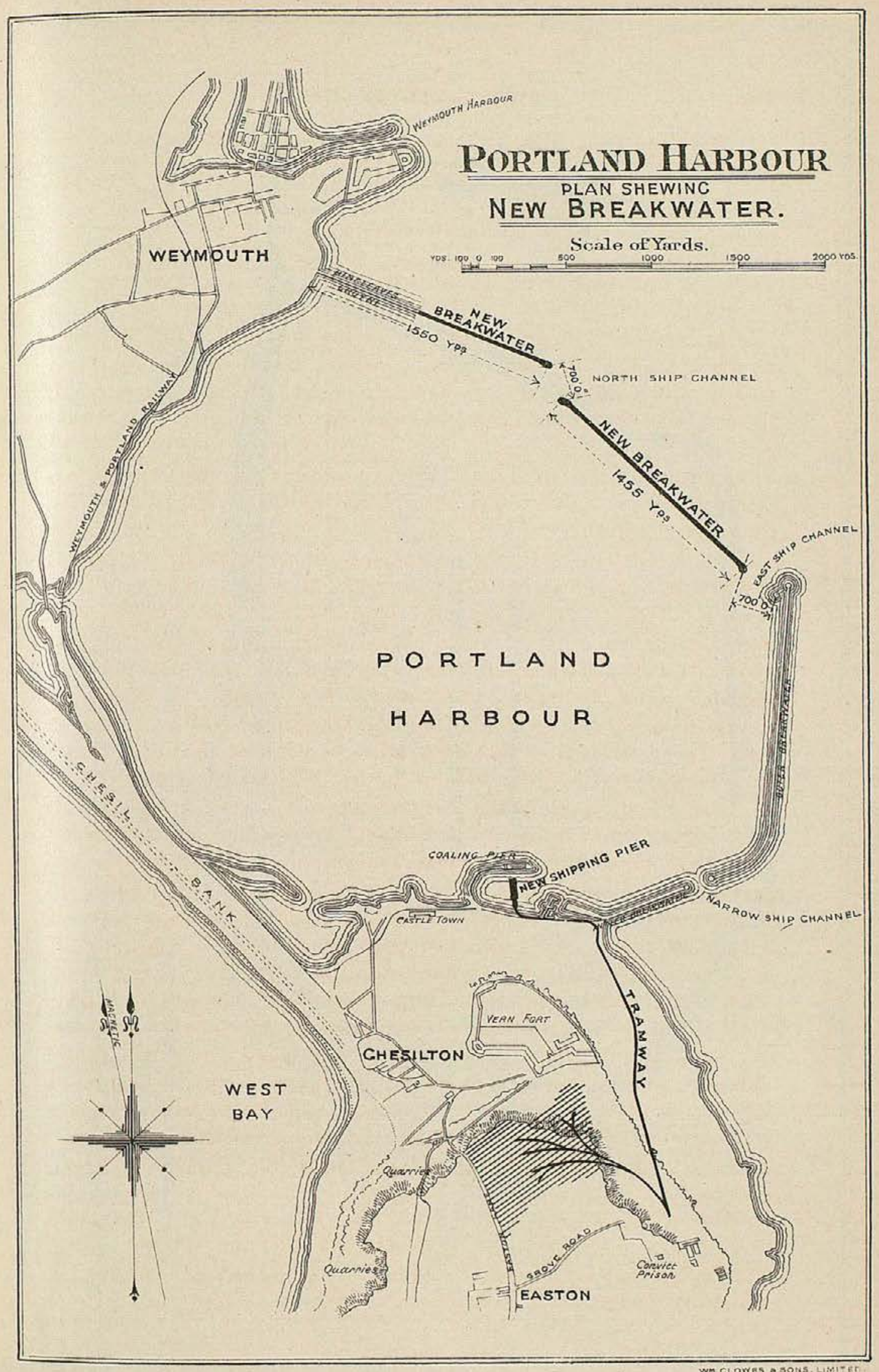
In the following year the expenditure proposed under the Naval Works Act had risen to £17,304,000. A large addition to the Harbour Works at Dover was provided for, involving an increase of over £1,500,000 on the original proposal, and the scheme for the extension of Hong Kong Dockyard was enlarged. The new features included naval barracks at Sheerness, the subsidy for the construction of a dock at Colombo, and improvements at Portsmouth, Pembroke, and Haulbowline dockyards—the cost of the latter being transferred from the works vote in the Navy Estimates of 1896–7.

Act of

In 1898 no Naval Works Act was passed, as the expenditure of 1897 left a surplus in hand. The Naval Works Act of 1899 made up for the omission, and introduced the practice of demanding votes covering two-year periods, and so preventing a fresh discussion in Parliament each year. The expenditure proposed had now risen to £23,636,922, an increase of more than six millions on the Act of 1897, or double the increase proposed in the Act of 1897 over that of 1896. With the exception of a sum of £450,000, provided for a new dock at Chatham, this increase of six millions was mainly accounted for by dockyards abroad. The scheme for Hong Kong was again enlarged, and the proposals to extend Malta and Bermuda dockyards, and practically to create a naval harbour and dockyard at Simon's Bay, were authorised, as well as considerable additions to the Naval Barracks at Keyham and Portsmouth, and to the Dartmouth Naval College for Cadets.

Act of 1901.

The Naval Works Act of 1901 is printed in full. The total expenditure then proposed amounted to £27,500,000, of which £7,270,820 had been spent by March 31, 1901, and £13,762,820 by March 31, 1902.



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HEADS OF PROPOSED EXPENDITURE.

Works.	Total Estimated Cost, 1901.	Expenditure to March 31, 1900.	Estimated Expenditure from April 1, 1900, to March 31, 1901.	Estimated Expenditure for the Financial Years 1901–1902 and 1902–1903.	Expected Date of Completion.
1.	2.	3.	4.	5.	6.
(a) *Enclosure and Defence of Harbours.*	£	£	£	£	
Gibraltar	1,239,000	765,541	179,843	213,000	1902–3
Gibraltar, commercial mole	*669,000	65,734	73,954	300,000	1903–4
Portland	†650,000	310,644	82,767	150,000	1903–4
Dover	3,500,000	275,073	298,017	700,000	1907–8
Malta Breakwater . .	1,000,000	—	—	50,000	1907–8
(b) *Adapting Naval Ports to present Needs of Fleet.*					
Deepening harbours and approaches. . . .	‡§1,100,000	703,236	32,185	350,000	—
Keyham Dockyard extension	4,175,000	865,830	432,783	1,052,000	1905–6
Portsmouth Docks . .	372,502	372,502	—	—	Completed
Gibraltar Dockyard extension	2,674,300	390,808	198,584	470,000	1904–5
Hong Kong Dockyard extension	1,275,500	62,694	27,822	150,000	1904–5
Colombo Dock . . .	159,000	15,000	21,000	72,000	1903–4
Pembroke Jetty, &c. . .	130,000	40,084	25,505	62,200	1903–4
Portsmouth, widening caisson	40,469	38,052	2417	—	Completed
Haulbowline improvements	63,000	48,512	9174	5314	1901–2
Chatham, dock . . .	450,000	224	14,328	190,000	1903–4
Malta Dockyard extension .	1,250,000	13,453	73,039	450,000	1907–8
Bermuda Dockyard extension	700,000	535	125,692	300,000	1906–7
Simon's Bay Dockyard extension, &c. . . .	‖2,500,000	28,525	6475	200,000	1907–8
Coaling facilities . .	§1,000,000	—	—	500,000	1905–6
(c) *Naval Barracks, &c.*					
Chatham Naval Barracks .	445,000	188,669	123,913	120,000	1902–3
**Naval Barracks for Medway Gunnery School .	220,000	1057	—	50,000	1905–6
Portsmouth Naval Barracks	670,400	237,600	94,974	235,000	1903–4
Keyham Naval Barracks .	230,000	65,231	50,687	57,000	1903–4
Chatham Naval Hospital .	379,000	42,680	44,650	170,000	1903–4
Walmer Marine Depôt .	17,658	17,658	—	—	Completed
Keyham Engineers' College	23,298	23,298	—	—	Completed
"Britannia" R.N. College .	315,000	62,335	34,875	100,000	1904–5
Magazines	870,000	221,891	138,186	309,332	1904–5
Haslar Hospital Extension .	68,500	26,750	29,596	12,154	1901–2
Haulbowline Zymotic Hospital	12,463	11,626	837	—	Completed
(d) *Superintendence and Miscellaneous Charges* .	1,303,074	182,015	72,310	224,000	—
	27,501,864	5,077,207	2,193,613	6,492,000	—

Total of columns 3, 4 and 5 . . . . . £13,762,820††

* The total estimated cost of the commercial mole is £700,000, including £31,000 for superintendence under item (*d*). Four-sevenths of this sum is to be repaid by the colony of Gibraltar in the form of an annuity of £14,000 per annum for fifty-seven

A sum of one million in each case was provided for further extensions at Keyham Dockyard, for the construction of a breakwater at Malta, and for coaling facilities. The expenditure on magazines is increased by about £400,000, and the superintendence and miscellaneous charges are brought up to the enormous total of £1,303,094.

Portland. We have been kindly furnished by the Admiralty with plans of all the important works to be executed under the Naval Works Acts. These we will now consider in detail. Dealing first with the home ports, the work carried out at Portland renders the harbour completely secure against a torpedo attack. The width of the opening between the north-eastern end of the outer breakwater and the Bincleave Rocks on the western shore of the harbour was about two miles. This opening has now been closed by two additional breakwaters, a detached breakwater 1455 yards in length, and the extension of the Bincleaves groyne for 1550 yards. The harbour now encloses the area of 1500 acres, having a depth of not less than 30 ft. at low water. The coaling facilities at Portland have been considerably improved. The expenditure of £650,000 on Portland is thoroughly justified. It is now one of the finest artificial harbours in the world. It is most suitably placed as a base for a fleet observing Cherbourg, and is not at a great disadvantage, as compared with Devonport, as the base of a fleet observing Brest.

Dover. The Admiralty harbour at Dover is to cover an area of 610 acres, of which 322 acres have a depth of not less than 30 ft. at low water, exclusive of the commercial harbour. The harbour is

years from the opening of the mole, to be credited as an appropriation in aid of Navy Vote 10.

† An expenditure of £40,543 was incurred during 1893–4 and 1894–5 in erecting dolphins on the line of the breakwater, and was charged to Vote 10 in those years. This is in addition to the estimate of £650,000.

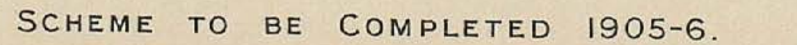
‡ Exclusive of the cost of dredging plant purchased prior to March 31, 1895.

§ It may become necessary to ask the sanction of Parliament to an increase of the total estimated cost of these items in a subsequent Bill, but without Parliamentary approval no works will be undertaken, or scheme partially completed, which will involve a liability beyond the sum named.

|| An expenditure estimated at £8300 was incurred during 1896–7 to 1898–9 on the preliminary survey for this work, and was charged to Vote 10 in those years. This is in addition to the estimate of £2,500,000.

** This item was formerly described as "Sheerness Naval Barracks."

		£
†† Total estimated expenditure to March 31, 1903		13,762,820
Expenditure already authorised, viz.:—		
Out of Navy Votes (8 and 10) prior to inclusion of works in Loan Acts	£ 241,820	
By Act of 1895 (£1,000,000 less £140,000 lapsed)	860,000	
By Act of 1896	2,750,000	
By Act of 1897	654,000	
By Act of 1899	3,100,000	
		7,605,820
Further expenditure to be authorised by this Act . . .		6,157,000



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enclosed by an extension of the Admiralty pier of 2000 ft., by a detached south breakwater 4200 ft. in length, and by an eastern arm running from the cliff under the convict prison for 3320 ft. in a S.S.E. direction. The eastern entrance is 600 ft. in width, the western, 800 ft. The construction of this harbour involves, as already stated, an expenditure of £3,500,000. It will no doubt be of value as the coaling base for a fleet observing the Straits of Dover, the European ports on the North Sea, and the entrance to the Baltic. The anchorage in the Downs, which was used by the fleets at the beginning of the last century, is within easy striking range of torpedo boats operating from Dunkirk or Calais, and therefore no longer satisfies modern requirements. The only justification, from the naval point of view, for the huge expenditure incurred at Dover being the desirability of providing a base for a fleet operating in the North Sea. The provision of a second base for this purpose on the Firth of Forth appears unnecessary.

The works at Keyham include a tidal basin, with an entrance in the Hamoaze, having an area of ten acres, with a depth of 32 ft. at low water. There is also provided a closed basin, with a coaling depôt at the northern end, which has an area of 35½ acres, and a depth of 32 ft. 6 in. at low water. Finally, there are three docks—No. 6, with a total length of 741 ft., depth of sills below high water and neap tides, 44 ft.; dock No. 5, length 745 ft., depth of sills below high water and neap tides, 32 ft.; and dock No. 4, length 460 ft., depth of sills, 32 ft. The entrance to the dock is 730 ft. in length, with 32 ft. for the sill at low water spring tides. These works are being constructed on the Keyham mudflats. The walls of the docks and basins have to be carried down to the rock, which in some cases is 100 ft. or more below the level of the coping; consequently the construction presents many difficulties, and is very costly. Plymouth Harbour is most conveniently situated as the base for a fleet observing Brest, or the other harbours of France in the Bay of Biscay. It would also probably be the base for any squadrons or individual ships operating in the North Atlantic in the time of war. It is therefore important that it should possess adequate docking facilities for ships of the largest size. Keyham.

The new docks at Portsmouth and Chatham have become necessary owing to the increase in the dimensions of modern ships of war. They do not seem to call for any comment.

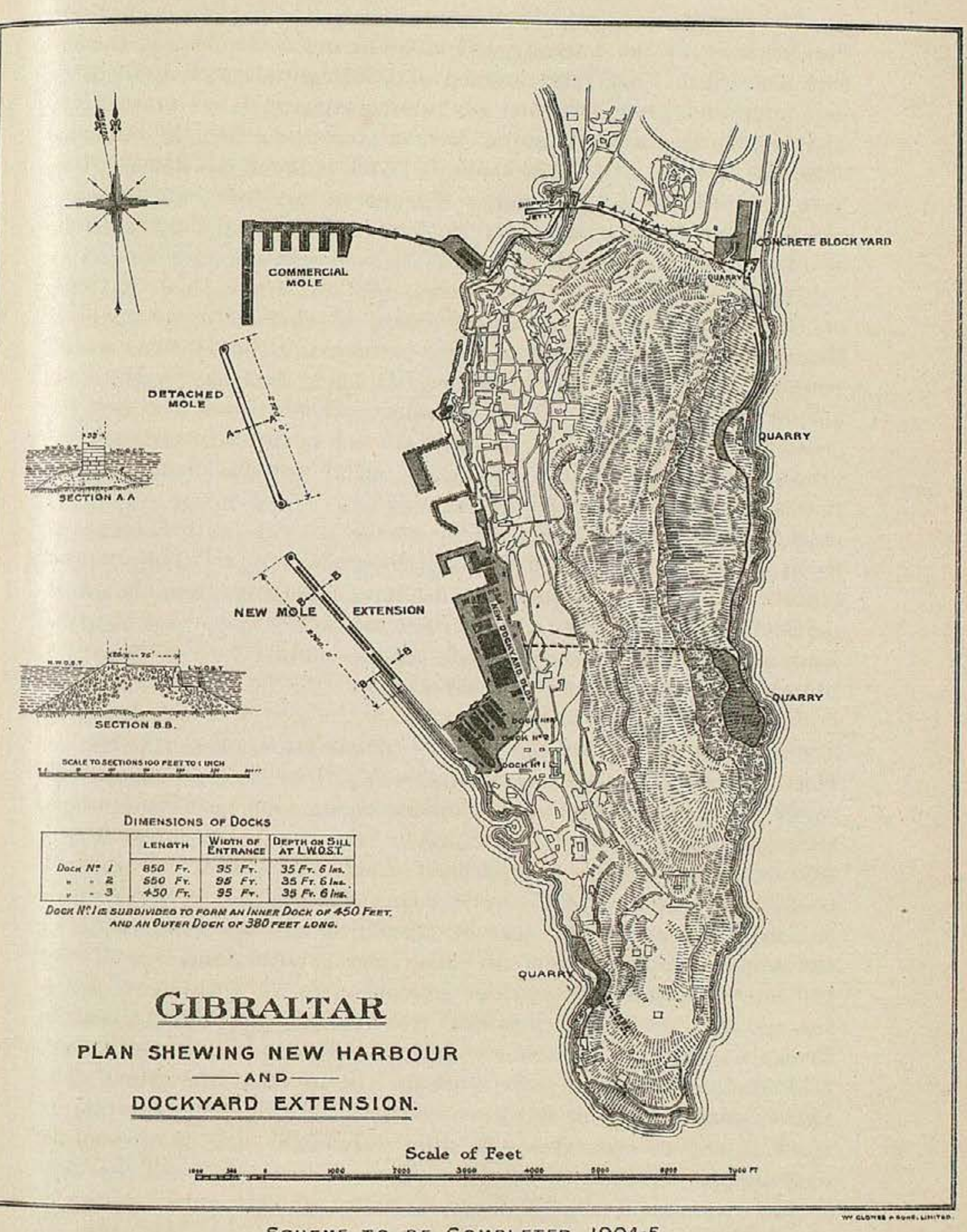
A sum of £1,100,000 is allotted by the Naval Works Acts to deepening harbours and approaches, and in a note to the Naval Works Act of 1901 it is stated that Parliament may have to be requested to authorise the expenditure of further sums for this purpose. Deepening harbours and approaches.

At Portsmouth the expenditure has been devoted to deepening the entrance to the harbour and to dredging a number of berths within it. The First Lord stated in his Memorandum of 1902 that the outer and inner harbours and approach channels are practically completed, and that in the inner harbour more than half the number of berths required have been dredged. At Devonport thirteen berths have been dredged, with a depth of water at low water spring tides of 24 ft., and five others are almost complete. Much dredging has also been done in the Tamar.

The deepening of the approaches to Portsmouth is an obvious necessity; but considering the number of obsolete ships with which the basins of our chief naval ports are encumbered, there is some doubt whether the sum spent on dredging berths in Portsmouth Harbour and in the Tamar is altogether justified. It must, however, be conceded that the enormous length of a modern cruiser requires a great deal more room to swing in, with the changing tides, than was the case with the older vessels.

Gibraltar. Turning to the dockyards abroad, the chief expenditure proposed is in connection with Gibraltar. Owing to its position at the entrance to the Mediterranean, Gibraltar is, perhaps, from the naval point of view, still the most important strategic port in the British Empire. It is the base on which the fleet must rest which is to prevent the junction of the French Atlantic and Mediterranean Squadrons, though it is not well placed as the base of a fleet observing Toulon. Owing to the increase of naval force in the waters of Northern Europe during recent years, which has been alluded to in a previous chapter, its importance is somewhat diminished. Gibraltar is not only of value as the base for one of our principal fleets, but it is also of use to the cruisers which must be employed to protect the trade with South Africa and South America, as well as with the East, whether passing through the Suez Canal or round the Cape of Good Hope. Moreover, the distance from Gibraltar to the nearest point of the African coast is only 11½ miles, so that a torpedo flotilla operating from Gibraltar would make the passage through the Straits at night extremely hazardous to any hostile fleet. Gibraltar is also an important port for the Mercantile Marine. The figures of shipping entered and cleared have varied in recent years from 8,000,000 to 9,000,000 tons. In 1898 the total slightly exceeded 9,000,000 tons.

The construction of a dock at Gibraltar was urged for many years by the founder of the *Naval Annual*. The works now in course of construction are designed, first, to create an anchorage secure from torpedo attacks, which had become a necessity owing to



DIMENSIONS OF DOCKS

	LENGTH	WIDTH OF ENTRANCE	DEPTH ON SILL AT L.W.O.S.T.
DOCK Nº 1	850 FT.	95 FT.	35 FT. 6 INS.
" - 2	550 FT.	95 FT.	35 FT. 6 INS.
" - 3	450 FT.	95 FT.	35 FT. 6 INS.

DOCK Nº 1 IS SUBDIVIDED TO FORM AN INNER DOCK OF 450 FEET. AND AN OUTER DOCK OF 380 FEET LONG.

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SCHEME TO BE COMPLETED 1904-5.

the French torpedo-boat stations in the Mediterranean. The works are also designed with a view to creating a general naval dockyard capable of dealing with the repairs of a considerable fleet. Under the first head are included the extension of the new mole for 2700 ft., the construction of a detached mole 2720 ft. in length—the cost of these two works being estimated at £1,239,000—and the extension of the commercial mole, the cost of which is estimated at £700,000, including £31,000 for superintendence. Four-sevenths of the latter sum are to be repaid by the colony of Gibraltar in the form of an annuity of £14,000 per annum for fifty-seven years from the opening of the mole, to be credited as an appropriation in aid of Naval Vote 10. When the harbour is completed a water area of about 448 acres will be enclosed, of which some 250 acres will have a minimum depth of 30 ft. at low water. The space for dockyard purposes, whether for the construction of docks or for the necessary workshops and buildings, is extremely limited. It has, therefore, been necessary to reclaim some 64 acres of land. The material required for this reclamation is obtained from quarries on the eastern side of the Rock by means of a tunnel. The three graving docks, all of which are 90 ft. in width at entrance, have a depth of 35½ ft. over the sill at low water spring tides. No. 1 Dock is 850 ft. in length, can be divided into two portions by a sliding caisson, and is capable of docking two ships simultaneously; No. 2 Dock is 550 ft., and No. 3 Dock 450 ft. in length.

The distance across the bay to Algeciras is only 4½ miles, and the great objection to it as a base is that the shipping, and any works that may be constructed on the western side of the Rock, would be exposed to bombardment from the Spanish hills. Owing to this fact there has been considerable misgiving as to the advisability of so large an expenditure. The question was raised in a pamphlet by Mr. T. Gibson Bowles, M.P., and Vice-Admiral Sir Harry Rawson was sent out to hold an inquiry into the subject. In this inquiry he was assisted by Major-General Sir William Nicholson, K.C.B., Mr. William Matthews, C.M.G., and Mr. Gibson Bowles himself. The Commission of Inquiry agreed that it was better to have a dock exposed to risks than no dock at all, and recommended that the works on the western side should be sanctioned and completed, with the exception of No. 2 Dock and one-third of the adjacent workshops and the storehouses, a saving being thereby effected of £300,000. Secondly, that a graving-dock should be constructed on the eastern side of the Rock, in a position where it would be completely protected from direct-aim fire, and to a large extent, if not entirely, from indirect

un-aimed fire. Further, that three moles should be constructed on the eastern side to form a sheltering harbour of about 400 acres, and that in this harbour arrangements should be provided for coaling ships and supplying stores and ammunition. An approximate estimate of the cost of constructing the harbour and graving dock, as suggested, on the eastern side, was prepared by Mr. Matthews, the total expenditure involved being approximately 5½ millions sterling. The proposal to spend such an enormous sum, in addition to that already being spent, on Gibraltar can hardly be contemplated seriously.

One of the objections to Gibraltar as a naval base has already been alluded to. The second is one which Gibraltar has in common with many of our dockyards abroad. It is an artificial dockyard in that all its resources, whether in men or material, must be drawn from oversea.

Malta. Malta has not the strategic position of Gibraltar because it does not lie on the French line of communications between the Atlantic and Mediterranean. It is inconveniently situated as a base for a fleet observing either Toulon or the Dardanelles. It is, however, in an admirable position as a base for a fleet masking Bizerta, where the French are establishing an important dockyard, should a naval force be concentrated there in time of war. Malta has hitherto been the sole dockyard for the repairs of the Mediterranean Fleet, which had outgrown its resources. The dockyard accommodation occupies some hundred acres on the arms of the Grand Harbour, known as Dockyard and French Creeks. There are four docks:—Nos. 1 and 2, with a total length of 525 ft., and with 25 ft. over the sill at average water level; No. 3, or Somerset Dock, 427 ft. long, with 34 ft. over the sill; Dock No. 4, or the Hamilton Dock, was completed in 1891, has a length of 520 ft., width 94 ft., and a depth of 35½ ft. over the sill at average water level. The extensions now proposed at Malta Dockyard include the construction of two new docks, which are being built by contract; estimated cost, £1,250,000. It is also proposed, as a defence against torpedo attack, to partly close the entrance to the Grand Harbour by a breakwater to cost £1,000,000. The wisdom of this expenditure appears exceedingly doubtful. The harbour of Malta is none too healthy now; the rise and fall of the tides in the Mediterranean are very small, and there is little circulation of water. There will be still less when the proposed breakwater is completed. A division of destroyers would be an equally effective defence, and much less costly.

That increased dockyard accommodation was necessary to meet the needs of the Mediterranean Fleet has been admitted. It should

MALTA

Scale of Feet.

100 50 0 100 200 300 400 500

FRENCH CREEK

MAST HOUSE

SAW MILLS

DOCK 5

DOCK 6

PUMPING STATION

DOCK 7

NEW FACTORY AND FOUNDRY

BOAT SHED

SLIP

STRADA SAN FRANCESCO

STRADA SAN GIOVANNI

STRADA DELLA GRAZIA

CURTAIN

NEW ROAD

DIVERSION OF

ST PAOLO BASTION

CHAIN DUIELI ROAD

CHAIN DUIELI ROAD

DITCH

NAVAL PARADE GROUND

MAGNETIC

Wm CLOWES & SONS, LIMITED.

SCHEME TO BE COMPLETED 1907-8

VALLETTA

SCHEME TO BE COMPLETED 1907-8

W^M CLOWES & SONS, LIMITED.

be, however, borne in mind that the natural resources and best equipment for carrying out large repairs being in the home dockyards, which can be reached in four days at moderate speed from the Mediterranean, and carry out repairs with greater celerity, there may frequently be a clear gain in sending a vessel home for repairs, as was done with the Howe last year when she lost her rudder. It is, therefore, hard to justify the large expenditure proposed both at Malta and Gibraltar. A dock capable of taking warships of the largest size was needed both at Malta and Gibraltar, but the policy of erecting at Gibraltar an important dockyard is at least doubtful.

Hong Kong.

It is unnecessary to insist on the value of Hong Kong as a naval base and as the centre of British trade in the China Seas. The shipping entered and cleared in 1900 aggregated over 14,000,000 tons. Including junks, the total amounted in 1901 to 19,325,000 tons. The scheme for the extension of Hong Kong Dockyard has gradually grown, through successive Naval Works Acts, from a moderate proposal, involving the expenditure of £340,000, to one on which it is estimated that £1,275,000 will be spent. The present yard will be increased from $4\frac{3}{4}$ to 39 acres and a tidal basin of $9\frac{1}{4}$ acres in extent will be constructed, having a depth of 30 ft. at low water springs, and with a total length of wharfage of 2900 ft. The dry dock in course of construction will be 550 ft. in length on blocks, 95 ft. wide at entrance, 30 ft. over the sill at low water springs. Extensive workshops will be erected on land formed by reclamation.

There has been considerable difference of opinion as to whether it was better to extend the dockyard in its present position, or in the neighbourhood of the Kowloon Docks, which are situated on the main land opposite the island. In view of the fact that the Russians are concentrating a large proportion of their naval strength in Chinese waters it is obviously necessary that we should maintain at the China Station a squadron which, in conjunction with the Japanese Navy, would be of sufficient strength to deal with the Russian Fleet in case of hostilities. A dockyard at Hong Kong is obviously a necessity, and together with the private resources it should be capable of dealing with the ordinary repairs of the squadron in time of peace. But, in view of the recently concluded alliance with Japan, it should have been possible to have made an arrangement with the Japanese by which their dockyards would have been available for His Majesty's ships in time of war. In addition, it should be remembered that Messrs. Butterfield and Swire are building private docks at Hong Kong.

Wei-Hai-Wei.

At Wei-Hai-Wei it has been decided not to undertake the large expenditure necessary to convert the port into a first-class naval

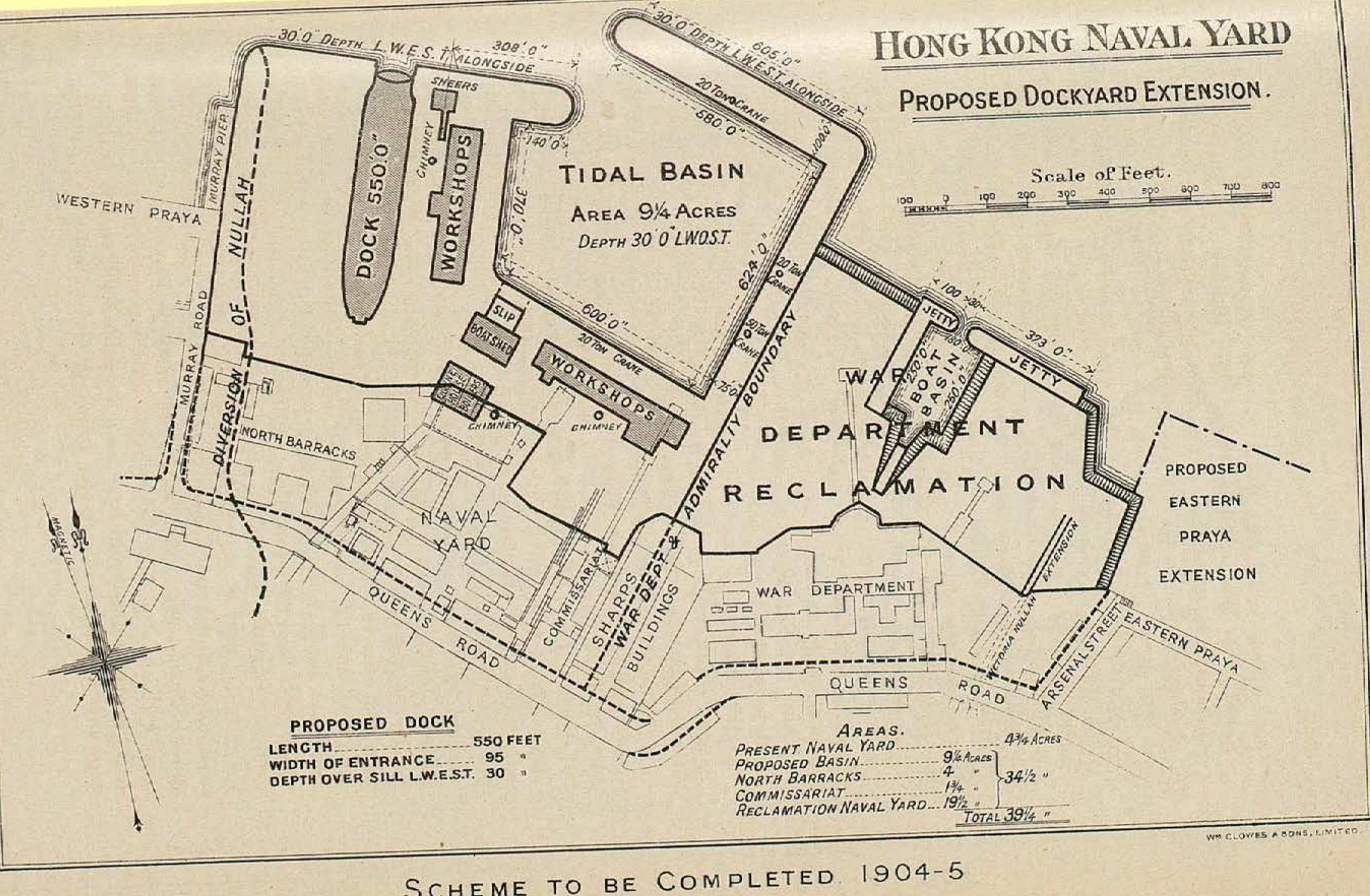
base, though dredging operations were commenced in 1898 and a naval depôt established in 1899. Wei-Hai-Wei has therefore been condemned as valueless. This view is an exaggerated one. Wei-Hai-Wei would certainly be of value as a coal depôt and supply base in the event of hostilities in the Gulf of Pechili. There is no necessity, however, to accumulate supplies there. Experience shows that there is a gain in efficiency and economy if supplies can be obtained direct from colliers and storeships. The base is then established in war wherever it is found most convenient for the purpose of operations against the enemy. The following statement of policy of the First Lord of the Admiralty, in which he said that he had the concurrence of his Board, is of interest :—

"Bricks and mortar as applied to naval expenditure are an evil, very often a necessary evil, but they are an evil. What we want are more ships, and every penny that is spent in bricks and mortar and land fortification which could be spent on more ships is money unnecessarily and badly spent. Every garrison that we have to lock up hundreds and thousands of miles away from this country is an evil, very often a necessary evil, but an evil to be reduced to the smallest dimensions possible. . . . The number of these bases and the money spent on them should be limited in the strictest manner to the absolute necessities of the Navy."

Simon's Bay.

The existing naval yard at Simon's Bay has no dry dock or deep water wharf. The new works, first proposed under the Naval Works Act of 1899, are estimated to cost £2,500,000, and in addition £1,000,000 for coaling facilities. These works consist of a tidal basin of 28 acres in extent, with a depth of 30 ft. at low water spring tides, and of a dry dock 750 ft. in length, an entrance 95 ft. wide, and with a depth of 30 ft. over the sill. This dock can be subdivided by a caisson into two docks 400 ft. and 320 ft. in length, or 470 ft. and 250 ft. in length, as may be required. Workshops will be constructed for the chief engineer's and chief contractor's departments on an area of 35 acres formed by reclamation from the sea.

The Cape of Good Hope is undoubtedly one of our most important naval bases, which may become of greater importance in war, should a large proportion of the commerce passing in time of peace through the Suez Canal have to be diverted to the route round the Cape. But it may well be doubted whether the enormous expenditure now being undertaken is justified by the circumstances, and whether it would not have been possible to make an arrangement with the Colonial Government for the construction of a dock in Table Bay which would have been available for both His Majesty's ships and merchant vessels, the Imperial Government contributing



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Simons Bay.

Scale

YARDS 200 150 100 50 0 200 400 YARDS

Coal Sheds
LIGHT
400′ 0″
400′ 0″
300′ 0″
20 TON CRANE
660′ 4″
WEST PIER
50 TON CRANE
965′ 0″
SHEERS
JETTY
DOCK
750′ 0″
BLOCK HOUSE
NEW APPROACH ROAD
CEMETERY FORT
ADMIRAL'S JETTY
ADMIRAL'S HOUSE
ARSENAL
DOCKYARD
NAVAL HOSPITAL
NEW NAVAL HOSPITAL

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SCHEME TO BE COMPLETED 1907-8

a part of the cost, and having in consequence a priority of claim for the use of the dock. The total tonnage entered and cleared from Cape Town in 1898 (before the figures were affected by the war) amounted to over three millions.

Lord Brassey, in a letter published in the *Times* on February 2, states the arguments against the expenditure at Simon's Bay very forcibly:— Lord Brassey in the *Times*.

"Leaving the Mediterranean, Cape Town, as it has been said, can never lose its importance as a naval base. No less than 3,347,000 tons of shipping in the foreign trade entered the port in 1901. The docks, establishments, and stores are of incalculable value to commerce. The anchorage in Table Bay is protected by a noble breakwater. Berthing accommodation is afforded in capacious floating basins. Considerable extensions have been projected, and, with aid from the Imperial Exchequer, could promptly be carried into execution. The graving-dock has hitherto been equal to every demand, whether for British or foreign ships of war. It has lately taken in a ship of 10,000 tons displacement; length, 500 ft.; beam, 57 ft.; draught, 23 ft. If a larger dock were necessary, it could be obtained, as at Colombo, Hong Kong, Halifax, and Vancouver, at a moderate cost by subsidising local or private enterprise.

"On the recommendation of the Royal Commission on Coaling Stations, strong works have been erected for the defence of Cape Town and Table Bay. It is not our policy to multiply fortified positions in distant parts of the world. Simon's Bay is separated from Table Bay by a narrow peninsula, which can be easily crossed in a morning's ride. It is less capable of defence. In considering the desirability of creating an independent establishment for the Navy in such a position and at so short a distance from Cape Town we have to take into view the annual charges, no less than the first cost of works. The skilled workmen employed at Cape Town in repairs for the Mercantile Marine being always available for the Navy, it is not necessary to maintain a large naval yard at Simon's Bay, with a full staff of officers and workmen, paid at colonial rates. At Gibraltar, where there are no local resources, a full dockyard establishment will shortly be required. This new and imperative demand should be kept in view in taking a decision with reference to Simon's Bay.

"Lastly, it is to be noted that, while we have docks at our command at Cape Town, Durban, and Mauritius, there is no dock along the whole extent of the ocean coasts of Africa other than English. No other maritime Power has any naval works of importance in hand south of the equator. The main efforts of the French are

concentrated on Bizerta; those of Russia on Vladivostock. The selection of positions for defended coaling-stations marks the intention of the Powers concerned to maintain their principal naval forces in the adjacent seas. It is far from Bizerta or Vladivostock to the Cape of Good Hope.

"It is somewhat thankless to labour in the cause of economy in any branch of naval administration. When, however, a Chancellor of the Exchequer, whose retirement was deplored by all his colleagues, has told us that a limit to expenditure has been reached, it becomes the duty of those who have given their attention to naval affairs to review estimates with the greater care. I have endeavoured to show that, if we are to retain in the future that commanding position which is the surest guarantee for the peace of the world, our resources would be applied to more advantage in shipbuilding than in the creation of a naval yard at Simon's Bay, thus duplicating the establishments already in existence close at hand at Cape Town."

Bermuda. The dockyard extension at Bermuda involved an expenditure of £650,000. The new floating dock in which the Sans Pareil was docked before it left the Medway has already arrived. Bermuda is mainly of importance as a naval station in the event of war with the United States. It would be also of some value as a base for the cruisers in protecting the North American trade in the event of war with a European Power. Lord Brassey says, in the letter already quoted: "The growth of our naval establishment at Bermuda had its origin in the Trent affair. In the relations of abiding friendship between Great Britain and the United States, additions to Bermuda cannot be regarded as especially urgent from the standpoint of the statesman." Three naval bases are maintained on the North American Station—viz., Halifax, Bermuda, and Port Royal. Concentration would lead to economy and increased efficiency. It is satisfactory to note that the Admiralty have taken the first steps in this direction by a reduction in the establishment at Port Royal.

Naval Barracks. The expenditure under this head includes the following:—

	£
Chatham Naval Barracks	445,000
Naval Barracks and Medway Gunnery School . .	220,000
Portsmouth Naval Barracks	670,400
Keyham Naval Barracks	230,000
Total	1,465,400

The justification for this large expenditure is to be found partly in the fact that the permanent force of the Navy has been practically doubled in the last twelve years, partly by the fact that barracks are considered, for sanitary and other reasons,

BERMUDA

His Majesty's Dockyard Ireland Island

Scale of Feet.

Moresby's Plain

Naval Quarry

NEW ROAD TO DOCKYARD

NEW WHARF WALL

NEW BREAKWATER

Magazine Island

800' 0"

970' 0"

NEW 1370' 0" BREAKWATER

Barracks

Storehouse

Storehouse

Boat Slip

Cask Stores

Store House

Victualling Yard

Store House

Keep

Floating Dock

Removed

BASIN

BREAKWATER

GRASSY BAY

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preferable to the accommodation previously provided for men in hulks. This argument is of great force, but against it might be urged that there are a large number of early armoured ships whose hulls are in good condition though the ships cannot be considered serviceable for war purposes. On the other hand, there can be no doubt that with the increases of the Navy there is a great demand for berthing accommodation at the great dockyards. The men in the depôts maintain the Fleet and Dockyard Reserve Ships, or are undergoing training, and must be at positions handy for their work. The old hulks, which the naval barracks at Whale Island superseded in 1890–91, were found very expensive to repair, and were in the way of essential improvements to the dockyard. The year 1890 marked the initiation of the schemes for barracks for seamen on shore. In that year the First Lord of the Admiralty stated that "the favourable results anticipated from the substitution of commodious buildings on shore for the old hulks in which the seamen were previously accommodated, have been fully realised in the case of Whale Island and Keyham, and the extension of the system of naval barracks is recognised as a matter of urgent necessity." In 1895, for similar reasons, barracks were commenced at Chatham, the First Lord stating that "in addition to the better sanitary arrangements, general comfort, and discipline of the men which barracks afford, it is necessary to remove the existing depôt hulks from the basins and elsewhere where space for berthing sea-going vessels is much required." It may be questioned, however whether it is necessary to send so many men into barracks for gunnery training when all the earlier stages of gunnery can be taught at sea. With the annual increases of the Navy, if the present systems of training are persisted in, something like barrack accommodation for an extra 500 men will have to be found every year in the gunnery establishments alone. The question is one calling for urgent consideration.

Naval hospitals.

Under the head of naval barracks must also be included the expenditure of £460,000 on naval hospitals, of which £379,000 is to be spent at Chatham. This expenditure is undoubtedly necessary. The decision to substitute buildings on shore for the present accommodation of Navy cadets involves an expenditure of £315,000, but the Royal Naval College under this scheme only provided accommodation for 260 cadets.

Policy of Admiralty

The Admiralty have made some attempt to arrest the increasing expenditure which was contemplated for future Naval Works Acts. The First Lord's Memorandum announcing the new scheme of entry and training of officers also referred to the policy of naval barracks

in the following words: "The following principles have been agreed upon by the Board:—

"That an accumulation of men in barracks on shore is a new feature in naval life, and that the utmost care must be taken to establish a system whereby the time of the men in barracks may be utilised to the greatest advantage of the Navy and themselves.

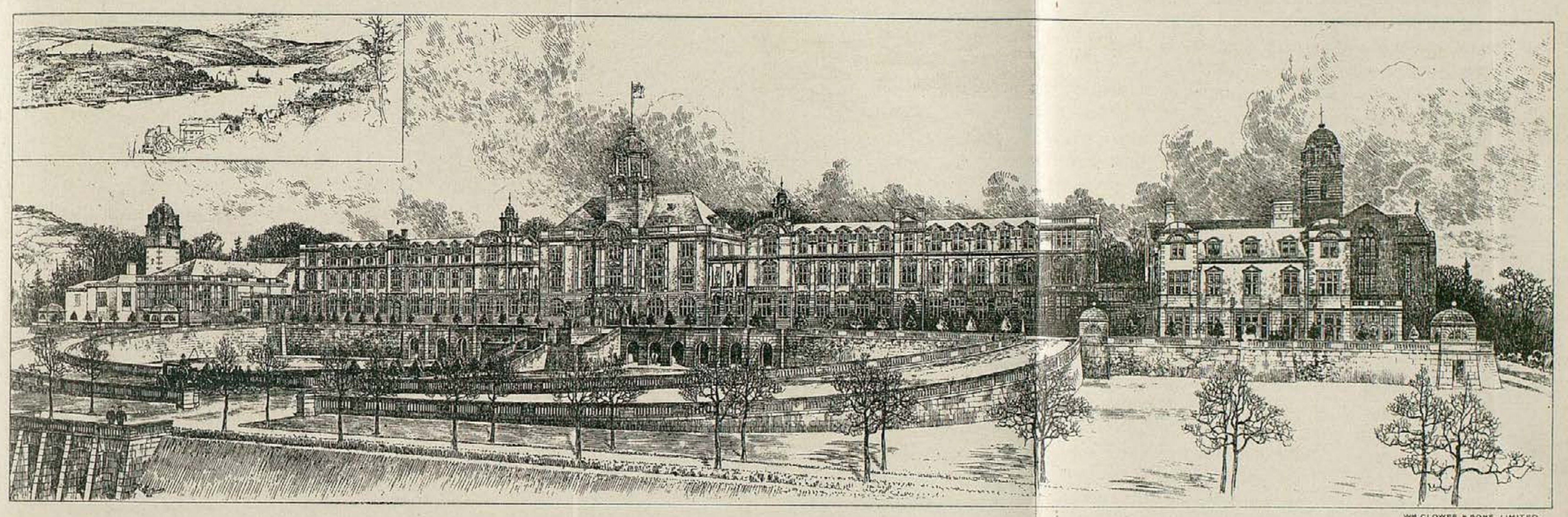
"That the lines on which the gunnery and torpedo schools may best be developed should now be settled, especially as the proposal has been brought forward that the torpedo schools should imitate the example of the gunnery schools in forming great shore establishments.

"The detailed plan on which these general principles will be put into operation will be most carefully considered; and I can only at present state that it has been decided not to build great barracks for the torpedo schools, or to transfer them to establishments ashore."

Magazines. We are expending under the Naval Works Act £870,000 in the construction of magazines. It is a curious phase of the present situation that in many cases the War Office occupies eligible sites on the foreshore at the great naval ports which would be of more value in the hands of the Navy. A large portion of the proposed expenditure on magazines is being incurred at Chatham, and there does not appear to have been sufficient preliminary inquiry as to whether the existing military magazines at Chatham are of any real use to the War Office, and as to whether an arrangement could have been made for making them naval property at a valuation.

Conclusion. In the short space of seven years the country has been saddled under the various Naval Works Acts with an expenditure of £27,500,000. Of the expenditure on naval works it may truly be said, "L'appétit vient en mangeant." The Act of 1895 provided for an expenditure of £8,800,000; that of 1901 covered an expenditure of £27,500,000. Many of the works in course of construction were undoubtedly necessary, some appear to be unnecessary while the wisdom of constructing others is at least open to question.

T. A. Brassey.



BRITANNIA ROYAL NAVAL COLLEGE, DARTMOUTH.—Mr. Aston Webb, A.R.A., Architect.

SCHEME TO BE COMPLETED, 1904-5.

CHAPTER VI.

Marine Engineering.

In last year's issue of the *Naval Annual* it was said that "we are now—if we are to believe some engineers, who certainly support their argument with very substantial facts—on the eve of one of these 'new departures' in steam engineering practice." This was stated in reference to the Parsons steam turbine, of which, in the marine engineering chapters of the *Naval Annual*, mention has frequently been made since this form of steam engine first made its appearance as a propelling instrument for vessels. During the past year the steam turbine has strengthened its position afloat, and the time has arrived when it is appropriate that a general description should be given of its principles of design and mode of action. The Parsons steam turbine.

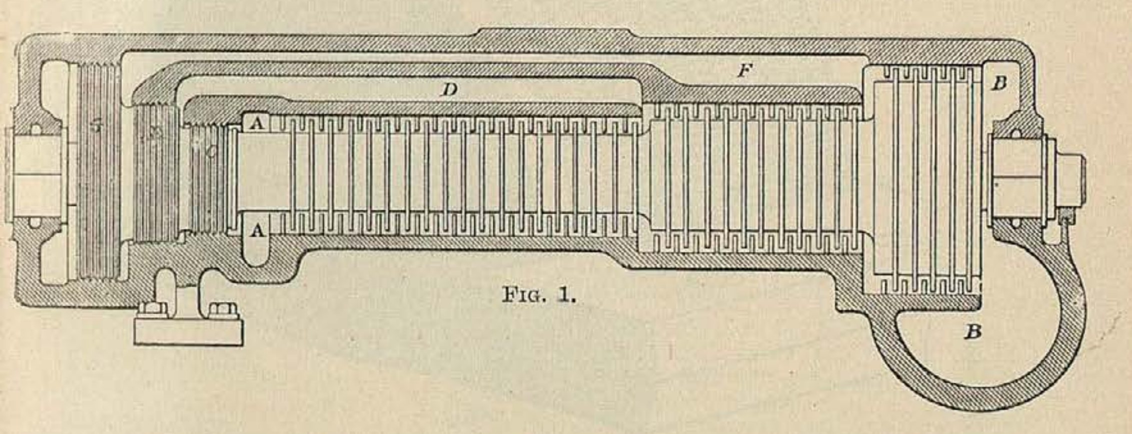


Fig. 1.

The Parsons steam turbine is essentially a rotary engine. Its author has overcome the one great difficulty that beset the path of former inventors—the construction of durable, steam-tight rubbing surfaces—by having no rubbing surfaces in that part of the mechanism which is the origin of motion. Fig. 1 shows in part a sectional elevation of a Parsons steam turbine. It is not designed for marine propulsion, but the illustration will suffice for the description of principles. A perspective view of a marine turbine was given in the *Naval Annual* for 1900. The turbine consists, as will be seen, of a cylinder or casing of somewhat complex form, the reason for which will appear as the description proceeds. Within this cylinder, which Principles of design.

is of variable internal diameter, is a shaft or spindle, also of variable diameter, and on this spindle are mounted the blades by means of which the shaft is rotated. There is another series of blades attached to the interior of the cylinder. The former are called the revolving or moving blades, the latter the fixed or guide blades. The diameter of the spindle is less than the internal diameter of the cylinder at all parts of its length respectively, and thus an annular space is left between the two. This space is occupied by the blades, and it is through it the steam flows. The rotating blades are attached to the spindle in the following manner. Undercut rings are turned in the spindle, and into these grooves the revolving blades are fixed by means of wedges or keys so that the blades are firmly

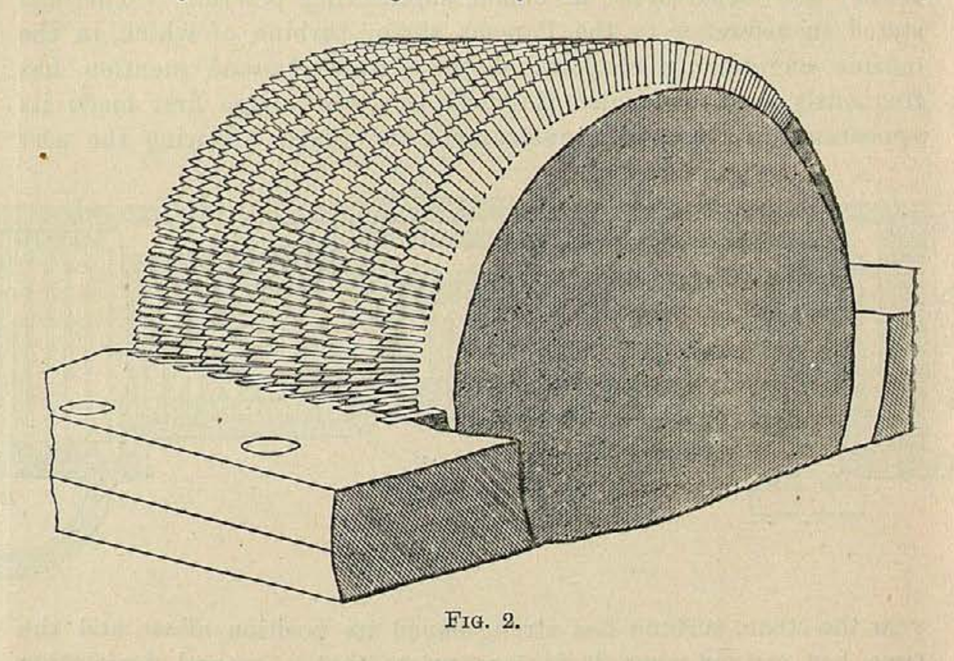


Fig. 2.

dovetailed into the spindle. This is an important detail of construction, as the centrifugal force due to the rapid rotation of the spindle and blades is very great and puts a severe stress on the attachment. Fig. 2 shows a part of a spindle with the blades in position. The rings of blades are not close together, but are placed far enough apart for rings of guide blades to be interposed. The guide blades are keyed into grooves cut in the interior walls of the cylinder. The lengths of the guide blades are such that they all but touch the spindle, whilst the rotating blades almost touch the cylinder. The clearance is thus reduced to the smallest extent, so that steam may not pass through without acting on the blades. In Fig. 2 the cylinder—which is, of course, made in two parts—has the top

part removed, but the position of the rings of guide blades is indicated clearly by the first row. It will be understood that the top part of the cylinder carries the other halves of the rings of guide blades so as to complete the circles that alternate with the rings of moving blades in the annular space.

Action of steam in the turbine.

Turning again to Fig. 1, steam enters the cylinder by the annular port, marked A, near the left-hand end of the spindle. It turns to the right and rushes with great velocity along the annular passage between the spindle and the cylinder, and, therefore, amongst the blades. It first meets a ring of fixed guide blades, which deflects it so that it strikes the adjoining ring of moving blades at such an angle that it exerts on them a rotative impulse. When the steam leaves these blades it has, naturally, been again deflected, and would

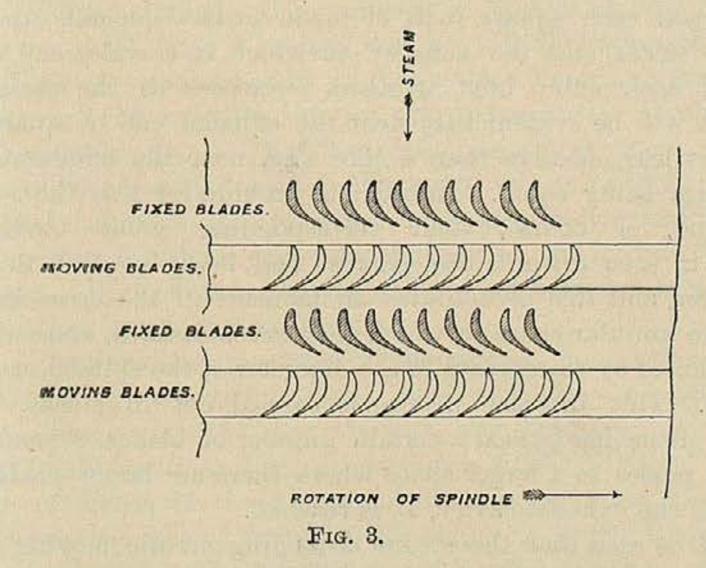


Fig. 3.

not be flowing in the direction necessary to drive the next ring of moving blades. A second ring of fixed blades is therefore interposed, and these direct the steam on to the second ring of rotating blades in the proper direction. The same thing occurs with succeeding rings of guide blades and moving blades until the steam escapes at the exhaust passage, B. The arrangement is illustrated in the diagram, Fig. 3, which is a plan indicating the angle at which the blades are set and their sectional form. If the action is followed it will be seen to be that of a marine propeller reversed; that is to say, in the turbine the fluid (steam) acts tangentially on blade surfaces, causing them to turn, whilst the propeller blade surfaces, acting on the water obliquely, put the latter in motion. Another analogue of the steam turbine is that of a number of many-sailed

windmills placed in front of each other, with deflecting vanes between to straighten the direction of the wind. It is the impact of the steam on the rotating blades that causes them to turn. This, of course, is a very different thing to the pressure of steam on the piston of an ordinary engine.

So far we have dealt with only one stage of the operation, but with the compound steam turbine the action is divided into several stages. It will be remembered that the supply of steam is continuous and that the exhaust passage B—shown at the extreme of the lower part of Fig. 1—is always open. As steam enters at approximately boiler pressure, and exhausts into the condenser at a pressure below that of the atmosphere, it must be expanding in volume, unless it condenses, during the whole period of the flow. The rotative force exerted upon each square inch of blade surface depends upon the weight of steam and the velocity at which it travels, and as the weight of each cubic inch of steam decreases as the pressure is reduced, it will be evident that near the exhaust end a square inch of blade is less effective than a like area near the admission end, other things being equal. In order to provide for this the rotating blades—and, of course, their corresponding guide blades—are increased in area towards the exhaust end, being made both longer and broader, and this necessitates an increase in the cross-sectional area of the annular space in which they are contained, and naturally is accompanied by an increase in the diameter of the spindle, as shown in Fig. 1. This increase in size is carried out in stages. Thus, when the steam has passed a certain number of blades, expanding as it goes, it passes to a larger space where there are larger blades, and so on until the exhaust cavity, B, is reached.

It will be seen that the steam impinging on the moving blades tends to move the spindle longitudinally in the same way that a propeller shaft has a force exerted upon it tending to thrust it forward into the vessel. In a ship this thrust is taken up by the thrust-block, which consists of a series of collars attached to the structure of the vessel, and engaging in grooves in the shaft. In the steam turbine, however, the thrust is taken up in another way. Inside the cylinder, and at the left of the admission port, there are on the spindle grooved pistons, or dummies, C, which fit into corresponding grooves in the cylinder. The steam pressing against the dummies balances the pressure on the first series of guide blades. After the steam has passed through the first series of blades it finds a passage, D, to another dummy piston at the back of the first, whilst the next stage is similarly balanced by steam passing through the passage F to the piston G.

The above will suffice as a rough outline of the main features of the Parsons steam turbine, but to exactly proportion the design so as to give high efficiency demands a knowledge of scientific principles that could not be discussed within the scope of this chapter. For one thing, the angle of blade surfaces should be governed by the velocity of the flow of steam, and that naturally is dependent upon the difference of pressure between the admission and exhaust. Beyond this, however, the velocity of the revolving blades should bear a certain proportion to the rate of travel of the steam. In actual work a compromise between practical and theoretical considerations has to be observed; and Mr. Parsons, by dint of scientific investigation and practical experience, has adjusted this compromise with great nicety, to judge by the admirable results in regard to steam consumption which he has secured. The passage of steam at high pressure, issuing as a jet from a boiler, say, at 150 lbs. pressure, into an atmosphere of a tenuity such as that within a marine condenser—say, within 2 lbs. or 3 lbs. of the zero of pressure—is enormously rapid, probably about 3500 feet per second or more, and the peripheral speed of blades, if a single set only were used, needed to meet these conditions and give reasonable efficiency would be beyond anything that could be conveniently applied, at any rate for marine propulsion. Indeed, the centrifugal force set up by so high a rate of travel might destroy the machine.

Advantage of the parallel flow turbine.

It is here that the advantage of the parallel flow turbine, such as Mr. Parsons has adopted, is made manifest. The drop in pressure of the steam when passing through any one ring of blades is comparatively small, and the expansion is further divided up into a number of stages in the compound turbine, as already explained. In this way the rate of travel of the blades is brought within more reasonable limits, and the number of revolutions per minute are reduced to a frequency which makes screw propulsion by the steam turbine possible. Still the speed of revolution with the steam turbine is much higher than that at which ordinary marine engines are run. The old second-class torpedo boats sometimes made 600 revolutions per minute, and the destroyers run at about 400 revolutions. The Turbinia, the first of the steam turbine boats, made over 2000 revolutions per minute, whilst the first destroyer propelled by turbine machinery—the Viper—ran at over 1000 revolutions per minute. To revolve ordinary screw propellers at that rate is a serious problem, owing to cavitation being induced. This subject was dealt with in the *Naval Annual* for 1898, when reference was made to the admirable researches of Sir John Thornycroft and Mr. S. W. Barnaby and the interesting experiments

of Mr. Parsons were described. Briefly, the main result was that, when the speed of a propeller blade revolving on water reaches a certain critical rate the water does not flow in at the back of the blade with sufficient rapidity to fill the space at the back of the blade, and the resistance to turning is therefore greatly increased.

The way in which Mr. Parsons has reduced the speed of blade surface has been two-fold—first, by making the screws of smaller diameter with wide blades and increasing their number; and secondly, by carrying out the total expansion of steam, from boiler pressure to condenser pressure, in two or more turbines in series, by which arrangement the steam, having to pass through more rows of turbine blades, necessarily travels at a slower speed, and so necessitates a more moderate speed of revolution in the turbines. This has been done in all turbine-driven vessels, as will be seen by the records given in former issues of the *Naval Annual.*

Large turbines more economical.

It will be gathered from what has been said that, with a given initial and exhaust pressure, the larger the steam turbine the slower may be the speed of revolution. This would follow, if only from the larger diameter of the machine, as it is the speed of travel of the blades (in regard to the velocity of steam flow) that has to be considered, and not the actual number of revolutions, and there are the other conditions to which reference has already been made. From the Turbinia to the Viper we get a reduction in the rate of turning of about fifty per cent. In the King Edward, the Clyde passenger steamer, the revolutions were again reduced to about 740 per minute, and in the designs of large ocean-going ships a rate of turning of about 300 revolutions per minute is contemplated. Naturally, with bigger ships and bigger propellers the peripheral speed of propeller blades for any given rate of turning is increased, as compared to smaller screws, but with triple shafting and five screws—two on the wing shafts and one on the centre shaft—no trouble from cavitation is anticipated.

Design of Atlantic liner with steam turbine machinery.

It will be of interest in connection with this part of the subject to give here some of the chief elements of a design for an Atlantic liner with turbine machinery, which has been prepared at the Wallsend yard of the Parsons Marine Steam Turbine Company. The vessel is to be 540 ft. long by 63 ft. wide, 41 ft. moulded depth, and 25 ft. 6 in. draught. The dimensions are therefore, moderate in view of what is now being done, as well as what is proposed for this class of vessel. The displacement is put down at 15,000 and the I.H.P. 23,000, and this gives an estimated speed of 21½ to 22 knots. There would be three turbine engines, each with its own shafting, the middle shaft carrying one

screw and the outer shafts each having two. Ordinary return tube boilers are proposed, having 1200 sq. ft. of grate and 42,000 ft. of heating surface. The working pressure would be 200 lb. to the square inch, and the estimated coal consumption will be 350 tons a day. A vessel fitted with ordinary engines would, it is calculated, have but 20,000 I.H.P., and would steam at about one knot less speed, coal consumption and other features mentioned being the same. There would, however, be one or two subsidiary advantages that may be fairly claimed for the turbine-propelled ship. Her engines could be kept beneath the lower deck, so that the space above them would be free, whilst the absence of reciprocation, and the consequent freedom from vibration, would allow such space to be used for passenger accommodation. These features also apply to war vessels to a greater or less degree. The facility with which turbine machinery can be kept below the armoured deck is, however, of very great value to a warship.

Reversal of the steam turbine.

To counterbalance the advantages on the side of the steam turbine there are some drawbacks. An ordinary triple expansion engine is reversed by the addition either of three reverse eccentrics and link motions or by other similar well-known means. The steam turbine, however, requires the addition of one or more separate reversed turbines usually fitted in the exhaust casing of the low pressure turbines, and the reversing of the turbines is effected by admitting steam to these reverse turbines and closing it from the ahead turbines. Another matter is the relative falling off of efficiency in turbines as compared with ordinary engines when run at reduced speeds. From the trials of the Viper this falling off appeared to be greater in the case of turbines than in ordinary engines. But to meet this drawback, either additional small turbines or reciprocating engines are added in the later vessels—the destroyer Velox, the third-class cruiser Amethyst, and the destroyer Eden. These small engines take the steam at boiler pressure, and after expanding it down to a much lower pressure, pass it on to the main turbines to complete the expansion down to the condenser pressure. Thus all the power obtained by the small engines is a net gain on the results of the Viper. The reports of the preliminary trials of the Velox indicate that these anticipations have been realized. This vessel has auxiliary low speed engines of the reciprocating type as stated in the *Naval Annual* of last year.

Efficiency at low speed.

It may be of interest to note that at the present time two cross-channel steamers are in the course of construction at the yard of Messrs. W. Denny & Bros., Dumbarton, to be fitted with Parsons turbines, supplied by the Wallsend works. One of these vessels is

being built to the order of the South Eastern and Chatham Railway for the Dover-Calais route, and the other vessel for the London, Brighton and South Coast Railway for the Newhaven-Dieppe route. Both of these vessels are to be on service this summer.

Hyacinth and Minerva trial.

In the last issue of the *Naval Annual* an account was given of some of the trials carried out by the committee appointed by the Admiralty to inquire into the question of water-tube boilers. It will be remembered that the cruiser Hyacinth with Belleville boilers and a similar ship, the Minerva, with return tube boilers were run against each other to Gibraltar and back. The Hyacinth did not come out well in the competition, one tube in her Belleville boilers bursting, and an abnormal quantity of water being lost through leakage on part of the run. The Minerva's boilers likewise did not perform in a manner altogether satisfactory, and, indeed, it was rather a question which boilers were the worst than which were the best. It was considered, however, by a good many engineers that the trials could hardly be taken as conclusive, at any rate in regard to the Belleville boilers, as the mishaps that occurred were exceptional rather than typical of the system. However this may be, it was decided to overhaul the vessels, and send them on another trial. This test has recently been carried out, but at the time of writing no details have been published officially, and some reports which have appeared in the Press have not the stamp of credibility. It would seem, however, that the Hyacinth has been again unfortunate, having to give up the contest through overheating of crank-pin bearings; a defect which some organs of public opinion have ingeniously put forward as proof of the failure of boilers.

Further report of Boiler Committee.

There has been issued during the past year another report of the Water-tube Boiler Committee, which gives valuable information on the subject. This publication * covers the complete results of the trials, under the direction of the committee, of H.M. torpedo gunboats Sheldrake and Seagull, and H.M. sloops Espiègle and Fantôme. The Sheldrake and Espiègle are fitted with Babcock and Wilcox boilers, and the Seagull and Fantôme with Niclausse boilers. The Babcock and Wilcox water-tube boiler was described and illustrated in the *Naval Annual* for 1901; the Niclausse boiler was also described, and its action illustrated by a diagram in the same issue. The tests were arranged so that the results obtained with each pair of ships should be as far as possible strictly comparable, but the committee's trials have been unfortunate, and their ill-luck did not leave them on this series. The vessels ran into

* Parliamentary paper [Cd. 1380.]

fog, and the engines also gave trouble, which on more than one occasion vitiated the results.

For each of the two torpedo-gunboats the programme included a preliminary trial, trials at about 1000 H.P., a trial at full power, and a coal endurance trial. It will be convenient to deal with the torpedo-gunboats first, and give particulars of the sloops afterwards. The principal details of all four vessels will be found in the tabulated list of ships in Part II. of this volume. The Sheldrake and Seagull are comparatively old vessels, having been launched in 1889. They belong to a distinct class that did not prove a success, especially in regard to the working of their original boilers, which were of the modified locomotive type, and several of them have been refitted with water-tube boilers; notably the Sharpshooter, the first vessel in the Royal Navy to have Belleville boilers, and the two vessels to which reference is now being made. Trials of Sheldrake and Seagull.

The Sheldrake's Babcock and Wilcox boilers were 4 in number and had a total area of fire grate of 252 ft., the heating surface being 9103 ft. The boiler pressure was 200 lbs. per square inch. The tubes were 7 ft. 4½ in. long, excepting the bottom rows, which were 2 inches shorter, their external diameter being $1\frac{13}{16}$ in. The weight of boilers, with funnels, spare parts, and hot water to working height, also pipes, fans, feed engines, and all boiler-room weights, was 124·8 tons, whilst the main engines, with propellers, spare parts, and evaporating and distilling plants, was 80·08 tons. The Seagull had six Niclausse boilers, with a total of 276 sq. ft. of grate, and 7932 ft. of heating surface. The tubes were 7 ft. 0¼ in. long, and 3¼ in. external diameter. The total of the boiler weights, with other parts as before, was 134·7 tons, and the engine weights on the former basis amounted to 78·9. The chief point of interest here is the considerable difference between the diameters of the boiler tubes; but it may be said at once that the Espiègle's Babcock and Wilcox boilers had tubes $3\frac{3}{16}$ in. in diameter.

The 1000 H.P. trials of the Sheldrake and the Seagull are the first dealt with in the report. The actual horse-power developed by the engines on these trials was 1001 for the Sheldrake, only two of her four Babcock and Wilcox boilers being used, whilst four of the six Niclausse boilers were fired to give steam for the 1028 H.P. of the Seagull. It may be here stated that on the full power runs of these vessels the I.H.P. of the Sheldrake was 2773, and of the Seagull 2818. The Sheldrake ran for twelve hours and the Seagull for eight on the 1000 H.P. trials. The boiler pressure with the Babcock and Wilcox boilers (it will be more convenient to give the names of boilers rather than those of the ships) was 145 lbs. to

the square inch, that of the Niclausse boilers 134 lbs. The actual evaporation of water per lb. of coal burnt in the former was 7·94 lbs., and in the latter 8·41 lbs. Reducing these amounts to an equivalent evaporation from and at 212° Fahr.—the proper standard of comparison—we have 9·50 and 10·15 lbs. of water evaporated by the two types of boilers respectively, and this gives thermal efficiencies 66·0 per cent. and 66·9 per cent.

Economy and weight of boilers.

It will be seen, therefore, that the figure of merit in regard to coal economy was 0·9 per cent. in favour of the Niclausse boilers. The Seagull's Niclausse boiler installation was, however, about ten tons heavier than that of the Sheldrake, and whereas only half the Babcock boilers were used, two-thirds of the Niclausse boilers were in operation during this trial. The relative weights of boiler in use may be taken as roughly: Babcock 62·4 and Niclausse 89·3. It must be remembered that the weights given include "extras." The evaporation per square foot of heating surface per hour was 3·87 lbs. for Babcock and 3·75 lbs. for Niclausse. It is not difficult to get a high thermal efficiency in any moderately good design of boiler if ample weight and space be allowed, and there was additional weight to account for the advantage of the Niclausse boilers in the competition. This advantage, however, is much greater than would appear on the figures already given. The committee very rightly took precautions to learn the quality of the steam generated. The usual crude method of ascertaining the quantity of water evaporated, or supposed to be evaporated, by a marine boiler is to measure the quantity pumped in as feed during a given time, and to accept that as the evaporative result, taking care, of course, that the water level is the same at the end of the trial as at the start. Such a course may give entirely misleading results; indeed, a boiler may be rated as meritorious on account of its faults. Thus, if there is priming, or a large quantity of unevaporated water going over with the steam, as is the case with ill-designed or over-worked boilers, the feed water will disappear very quickly without making any great demand on the fuel, going through to the engines to do harm and leading to the rapid condensation of the steam that does get over to the cylinders. In this way a good engine may appear to have a low efficiency and a bad boiler a high one.

Wetness of the steam.

On the trials the percentage of water in the steam was determined in the usual way by a Carpenter calorimeter, and it may be concluded that the committee took care to get fair average samples—a most needful precaution, without which calorimetric observations may be extremely misleading. With the Babcock boilers the

average wetness of steam was 4·23 per cent., with the Niclausse boilers it was but 0·69 per cent. The heat expended upon priming water was 3820 British thermal units per minute with the Babcock boilers, and 700 units with the Niclausse boilers.

Reference has already been made to the difference in weights, the influence of which is seen in the areas of heating surfaces and grates. The two Babcock boilers had in use 126 sq. ft. of grate and 4551 ft. of heating surface. The four Niclausse boilers had 184 sq. ft. of grate and 5288 ft. of heating surface. The Babcock boilers had to burn the fuel more quickly, consuming 17·6 lbs. per hour per square foot of grate, as against 12·8 lbs. for the Niclausse boilers. This would mean a hotter fire for the former, and accordingly the rate of heat transmission was higher—namely, 4525 British thermal units per hour per square foot of heating surface, as against 4380 units for the Niclausse boilers. Again, the same influence is traced in the heat of the chimney gases, the temperature for the Babcock boilers being 654° Fahr., whilst with the Niclausse boilers it was 561° Fahr. The air temperature on deck was 69° for the former and 46° for the latter. The temperatures of chimney gases were, however, taken within about 6 ft. of the top of the boilers. How far an additional 737 ft. of heating surface in the Babcock boilers would have put them on an equality in regard to the quality of steam generated and fuel economy can only be surmised. Whether the makers of the boilers had any voice in determining the proportion to be used does not appear, but it is very probable they were consulted on the matter.

Full-power trials.

We may now turn to the full-power trials of these two torpedo gunboats. After the explanations already given it will be more convenient to give corresponding details from these trials in the table on the next page, and in order to afford a ready means of reference, the particulars of the 1000 H.P. trial are repeated.

Comparative rates of evaporation.

A comparison of the two pairs of runs shows the chief difference is in the quality of the steam, but this is largely to be accounted for by the rates of evaporation. It will be seen that the results from the Niclausse boilers deteriorated nearly 2½ per cent., the wetness having risen from 0·69 to 3·15 per cent. When we see that on the lower powered trial the evaporation of water was at the rate of 3·75 lbs. per square foot of heating surface per hour, whilst in the second trial it was 6·11 lbs., we might conclude from the figures that more was being taken out of the boilers than was judicious from the point of view of economy. The Babcock boilers, however, show a comparative improvement. The rate of evaporation does not increase in as high a ratio, going only from 3·87 lbs. to 4·82 lbs. of water per square foot

TABLE I.

—	1000 H.P. Trials.		Full Power Trials.		1000 H.P. Trials.		Full Power Trials.		Coal Endurance Trials.	
	Sheldrake B. and W. Boilers.	Seagull Niclausse Boilers.	Sheldrake B. and W. Boilers.	Seagull Niclausse Boilers	Espiègle B. and W. Boilers.	Fantôme Niclausse Boilers.	Espiègle B. and W. Boilers.	Fantôme Niclausse Boilers.	Espiègle B. and W. Boilers.	Fantôme Niclausse Boilers.
1. Duration of trial	12 hours	8 hours	8 hours	8 hours	9 hours	9 hours	9 hours	9 hours	90 hours	90 hours
2. State of sea	Smooth	Smooth	Rough	Smooth	Moderate	Smooth	Smooth	Smooth	Smooth to rough	Moderate
3. Number of boilers in use	2	4	4	6	4	4	4	4	4	4
4. Area fire grate used . . . sq. ft.	126	184	252	276	144	135	144	135	144	135
5. Area heating surface used . . sq. ft.	4551	5288	9103	7932	4040	3960	4040	3960	4040	3960
6. Carbon value coal as fired	0·97	1·01	0·99	1·02	1·01	1·01	1·01	1·01	Not known	1·01
7. Average temperature, Fhr., chimney gases	654°	561°	743°	689°	557°	583°	683°	707°	593°	Not taken
8. Loss of feed water per hour	408 lbs.	330 lbs.	1100 lbs.	846 lbs.	780 lbs.	325 lbs.	352 lbs.	154 lbs.	387 lbs.	211 lbs.
9. Mean steam pressure in boilers per sq. in.	145 ,,	134 ,,	149 ,,	135 ,,	206 ,,	225 ,,	227 ,,	219 ,,	228 ,,	218 ,,
10. Average wetness of steam . . per cent.	4·23	0·69	3·95	3·15	0·83	2·00	nil	4·30	Not measured	
11. Heat expended on priming water	3820 B.T.U.	700 B.T.U.	8300 B.T.U.	7100 B.T.U.	750 B.T.U.	2350 B.T.U.	..	5100 B.T.U.	..	..
12. Thermal efficiency of boiler . . per cent.	66·0	66·9	59·2	62·1	73·2	69·8	67·0	60·4	63·1	59·9
13. Actual evaporation per sq. ft. of heating surface per hour	3·87 lbs.	3·75 lbs.	4·82 lbs.	6·11 lbs.	4·30 lbs.	4·17 lbs.	6·13 lbs.	5·74 lbs.	4·18 lbs.	4·00 lbs.
14. Equivalent evaporation from and at 212° Fhr. per lb. of coal	9·50 ,,	10·15 ,,	8·67 ,,	9·40 ,,	11·02 ,,	10·50 ,,	10·11 ,,	9·06 ,,	9·53 ,,	9·08 ,,
15. Coal burnt per sq. ft. of grate per hour	17·6 ,,	12·8 ,,	23·6 ,,	21·9 ,,	13·0 ,,	14·0 ,,	20·0 ,,	22·0 ,,	14·5 ,,	15·4 ,,
16. Heat transmitted per sq. ft. of heating surface per hour	4525 B.T.U.	4380 B.T.U.	5532 B.T.U.	6978 B.T.U.	4930 B.T.U.	4862 B.T.U.	6980 B.T.U.	6620 B.T.U.	4760 B.T.U.	4606 B.T.U.
17. Collective average I.H.P. of engines	1001	1028	2773	2818	1003	1010	1404	1373	1021	1022
18. Water supplied for make-up feed per 1000 I.H.P. per 24 hours	4·37 tons	3·43 tons	4·25 tons	3·21 tons	8·34 tons	3·45 tons	2·68 tons	1·20 tons	4·06 tons	2·21 tons

of heating surface per hour. Still, there is an increase, but in spite of this the quality of the steam improves, going from 4·23 per cent. of wetness down to 3·95 per cent. One would have thought the figures would have been reversed.

Another detail of design may affect the quality of the steam, however, and that is the area of water surface from which steam is collected. In most water-tube boilers there is a drum which is about half full of water, and through this water the bubbles of steam ascend after they have been generated in the tubes below. If the water plane is small the action will be violent, and water will be carried over with the steam. In the Seagull's boilers the steam drum was 2 ft. 7½ ins. in diameter and 7 ft. 3 ins. long. On the 1000-H.P. trials this area of steam-collecting surface was evidently sufficient, as the steam was practically dry; but the larger volume of steam generated per unit of heating surface and per unit of water area in the drum would account for the falling off in the quality of the steam, or, to speak more accurately, for the admixture of water with it, on the full-power trials. The same explanation, naturally, cannot be given of the improvement of the Babcock boilers of the Sheldrake, as reverse conditions prevailed. The Babcock boilers in this vessel had steam drums 3 ft. in diameter and 12 ft. 8 in. long on the water line. What arrangements were made in regard to internal pipes for collecting steam do not appear from the report. Probably they were ample for the purpose. It must be remembered, however, that the total heating surface in the Niclausse boilers was distributed between six steam drums, and on the Babcock boilers between four. The total water used by the engines and boilers combined was greater in the Seagull than in the Sheldrake, but as this is a boiler report it is considered advisable not to complicate the matter by the inclusion of engine efficiencies; more especially as the steam wetness has been considered.

A third set of trials of longer duration was made with the two torpedo-gunboats, to test coal endurance, and in these the efficiency of the Babcock boiler is given as superior to that of the Niclausse boilers. As, however, the trial of the Seagull had to be stopped owing to fog and engine defects, as the wetness of the steam was not ascertained, and, moreover, the stoking is described "poor, the stokers being inexperienced," the records for these runs need not be given.

Trials of Espiègle and Fantôme.

We now pass to the trials of the two sloops, both new in 1901, and fitted with engines of similar design. The Espiègle had four Babcock and Wilcox boilers, with a total fire grate area of 144 ft., and a total heating surface of 4040 sq. ft. The Fantôme had

four Niclausse boilers, with a total of 135 sq. ft. of grate, and 3960 ft. of heating surface. The Babcock tubes were $3\frac{3}{16}$ in. in external diameter and 6 ft. 10 in. long, the Niclausse tubes being 3·3 in. in external diameter and 6 ft. $4\frac{3}{8}$ in. long. The weight of the Babcock boilers, spare parts, etc., etc., as before detailed, was 95·1 tons, and that of the Fantôme's boilers 76·5 tons. It will be seen that there is a notable difference in the design of the Babcock boilers, the small tubes of the Sheldrake ($1\frac{13}{16}$ in. diameter) being replaced by tubes approximating in diameter to those of the Niclausse boilers. For horizontal tube boilers there is no doubt that this was an improvement, although, as will be seen, the relative total weights of the two types of boiler are reversed, the Babcock becoming the heavier installation. The steam drums of the Babcock boilers in the Espiègle were 3 ft. 6 in. in diameter and 9 ft. 6 in. long, whilst in the Fantôme the diameter was 2 ft. $7\frac{1}{4}$ in. by 5 ft. 11 in. long. It will thus be seen that the Babcock boilers had more than double the water area (130 sq. ft.) of the Niclausse boilers (60 sq. ft.), an economy of doubtful benefit for the latter. Three sets of trials were also made with the sloops. The first were at 1000 H.P., the second at full power, and the third as coal endurance trials. Some of the results of these are given in Table I. on page 126. For total results and other details not here included the original official publication must be consulted.

Loss of water.

In running down the columns of figures it will first be noticed that the Niclausse boiler in the sloops retains the superiority shown by the torpedo-gunboat trials in regard to loss of feed water; indeed, the figures in this respect are remarkably satisfactory. Loss of water is not, by any means, confined to boilers, but the excessive waste shown on some former trials with Belleville ships was undoubtedly due to the steam generating apparatus. Founding conclusions on these exceptional cases it has been urged that water-tube boilers must always need an abnormally large amount of "make-up" water, and it is satisfactory to see this pessimistic view negatived. Whether the superiority of the Niclausse boiler is due to the fact that the tubes are closed at one end, so that the chance of leakage through joints is reduced by one half, or whether it is due to the excellent character of the work for which the English firms who made the boiler have so high a reputation, is a matter that is open to question.

In evaporation for a given quantity of coal burnt the Babcock boilers of the sloops take the lead, and the thermal efficiency naturally follows, as shown by the figures in the table. Moreover, the wetness of the steam on the only pair of trials where comparison can be made

is largely in favour of the Babcock boiler, thus again reversing the earlier records with the gunboats. Here, although each unit of heating surface has more duty in the Niclausse boiler, the size of the steam drum, or separator, undoubtedly plays an important part; but the chief feature to notice is the increased diameter of the tubes in the Babcock boilers of the sloops as compared to those of the torpedo gunboats. It will be seen that with a higher rate of evaporation for a given area of heating surface the thermal efficiency of the large-tube Babcock boilers is considerably higher than that of torpedo gunboats, whilst the dryness of the steam in the one case given has improved greatly.

Horizontal and vertical tubes.

It must be remembered, however, that we are dealing with horizontal tube boilers, or tubes that are so nearly horizontal that they may be so called to distinguish them from tubes that are only slightly inclined from the vertical, as in other types of boilers. In the *Naval Annual* of 1896 the problem of circulation in water-tube boilers was dealt with, and since then reference has at times been made to the different phenomena which affect the evaporation of water in vertical and horizontal tubes respectively. A consideration of the conditions of the two cases will show that the rules which apply to horizontal tubes are by no means applicable to vertical tubes; indeed, very opposite results are often obtained in the two cases from similar details of design in other respects. This is notably the case in regard to the diameter of tubes. That small diameter for vertical tubes is advantageous has been proved by experience. Probably the most complete series of trials yet carried out with a vertical tube water-tube boiler fitted in a vessel of any considerable power were those made some years ago by Dr. Alexander B. W. Kennedy on the boilers of a first-class torpedo boat built by Messrs. J. I. Thornycroft and Co. Although the tubes on the Thornycroft boiler have a considerable curve in them, they may, for our present purpose, fairly be classed as vertical.

Dr. Kennedy's tests.

The torpedo boat in question had two boilers, but only one was subject to test. It had 30 sq. ft. of grate, and 1837 ft. of heating surface. These boilers were of the original Thornycroft design, practically of the same type as was illustrated and described in the *Naval Annual* for the year 1896, p. 123, and have tubes about 1 in. in diameter. A number of trials were made at varying rates of evaporation. One carried out at a steam pressure of 149 lbs. per square inch may be taken as representative, and will be convenient as corresponding to the pressure carried on the full-power trial of the Sheldrake. Moreover, the evaporation per square foot of heating surface per hour was very nearly the same, the rate being 4·7 lbs.

with the Thornycroft boiler as against 4·82 on the full-power trial of the Sheldrake. So far, therefore, the results are fairly comparable. The coal burnt per square foot of grate per hour was higher with the Thornycroft boiler, averaging 29·8 lbs., a difference of about 6 lbs. in excess of the Babcock boiler results. This, however, is not a matter of great importance as affecting the results. The equivalent evaporation per lb. of coal from and at 212° Fahr. was 11·35 lbs., as against 8·67 lbs. on the full-power trial of the Sheldrake, and the efficiency of the boiler worked out at 78·2 per cent., as against 59·2 per cent. for the Sheldrake. The fuel used on both the Thornycroft boiler trial and the Boiler Committee's trials was the best Welsh coal, hand picked. It should be stated that the trial here mentioned was not the best of the series, the boiler efficiency being considerably higher on other tests.

The greatly superior results obtained with small tubes arranged vertically will be apparent. It is to be regretted that Dr. Kennedy did not make his test of longer duration, as it only lasted 4 hours. Dr. Kennedy's trials may, however, be accepted with less reservation than it is usually advisable to exercise, and there is no doubt the tabulated results correctly represent the conditions, more especially as they are corroborated by the other tests.

Large and small diameter tubes.

The more practical question is not whether small tubes should be arranged vertically or horizontally, for that matter may be considered beyond discussion, but whether small diameter vertical tubes are superior to large diameter horizontal tubes. The figures given above may be taken as a practical contribution towards the solution of this problem, though it will be seen they only deal with one part of the question. The highest efficiency reached on any of the Boiler Committee's trials was 73·2 per cent. on the 1000-H.P run of the Espiègle, or 5 per cent. below that of the Thornycroft boiler, even though the rate of evaporation was somewhat lower on the sloop's trial. The question of small or large diameter tubes for boilers has, however, been more than once dealt with in previous issues of the *Naval Annual.* This last report of the Boiler Committee gives additional information upon the question, and will enable those who have followed the discussion to support opinion by ascertained fact. Those interested in the problem would do well to refer again to the admirable model experiments made by Mr. Yarrow for the purpose of illustrating the circulation of water-tube boilers. By means of glass tubes heated by gas flames Mr. Yarrow showed how steam is formed, and the way in which it separates itself from water in vertical tubes, and also how circulation is maintained. A fully illustrated account of these experiments was given in the issue of

Engineering for January 10th, 1896, and they were also referred to in the *Naval Annual* for 1896, p. 128. It will be seen by reference to these experiments that Mr. Yarrow's conclusions in regard to circulation in small diameter tubes are fully borne out by the Boiler Committee's trials with the Sheldrake and Espiègle boilers.

Shallow draught gun-boats. Mr. Yarrow's improvements.

In the *Naval Annual* for 1898 a description and illustration were given of some shallow-draught river gunboats built by Messrs. Yarrow and Co., of Poplar, for the Government. It will be remembered that in these vessels the propellers were placed in tunnels or raised parts of the bottom plating. By this device a screw of comparatively large diameter could be fitted to a very shallow boat. The draught of water with the vessels loaded was no more than 2 ft., but the screws were almost double this in diameter, and were always immersed when running, owing to the water rising in the tunnel. Although a very good speed was reached, about 11½ knots, it was found that there was a loss of power when the vessel was loaded down in consequence of the screw race being thrown against the sloping after part of the tunnel or screw chamber. In order to overcome this defect, Messrs. Yarrow and Co. have introduced a modification of the arrangement. The bottom edges of the tunnel must necessarily dip below the load-water plane, otherwise the water would not rise in the cavity, for reasons set forth in the description of these boats formerly given. In the newer vessels, however, the after part of the tunnel is formed by a hinged flap as shown in the illustrations, Figs. 4 and 5, for which we are indebted to *Engineering*. Fig. 4 gives a view of a boat fitted on the original

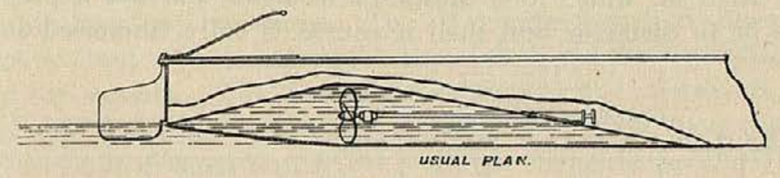


FIG. 4.

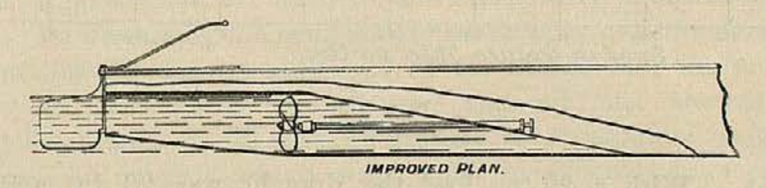


FIG. 5.

plan, and at light draught, whilst Fig. 5 shows the new type with the hinged flap, the boat being at full load draught. The advantage of the flap arrangement is felt when the boat has to be loaded down, as in Fig. 5. Then the flap is raised by suitable mechanism on deck and the obstruction to the free run of the propeller race is removed.

In practice this device has been found of considerable value, as will be gathered from the diagram, Fig. 6, giving speed and power curves. The boat by which these curves were obtained is 75 ft. long and 9 ft. 3 in. wide. She draws 11 in. light, and has a propeller 2 ft. 6 in. in diameter, and this, of course, is fully immersed at any

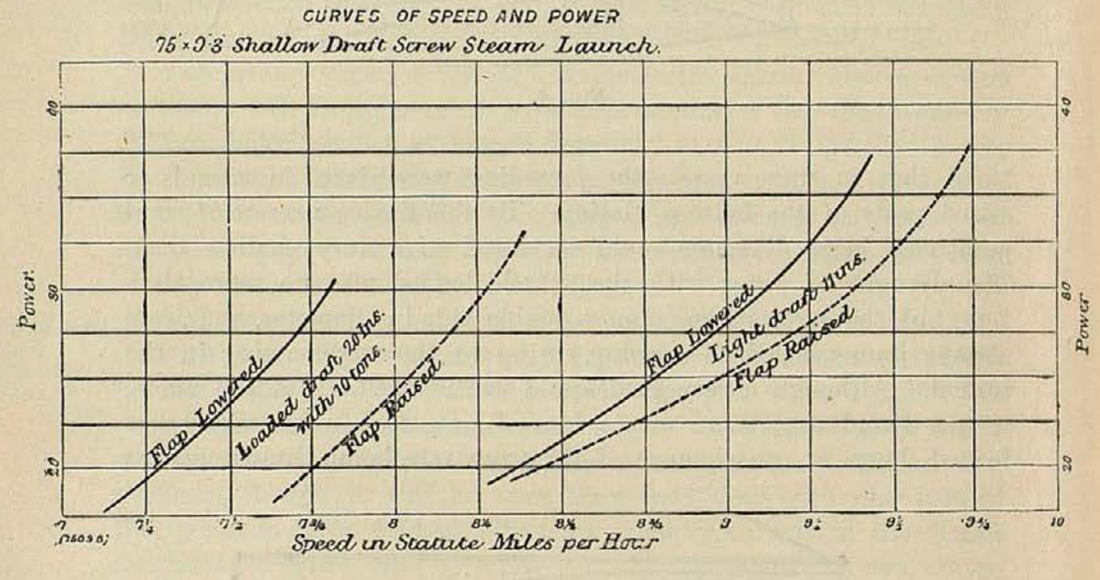


Fig. 6.

draught. With a 20-ton load the draught was 28 in. and the speed 7¾ miles an hour.

Liquid fuel for ships. The recent discoveries of increased supplies of liquid fuel in Texas and in Borneo, and the facilities that have been developed for transporting the material over sea, have once more brought the liquid fuel question to the front. As has been stated in the *Naval Annual* on a previous occasion, the question of burning liquid fuel is one largely of expense. There is no insuperable difficulty to raising steam in this way, although, doubtless, there is room for improvement. For a long time past, perhaps thirty years or more, liquid fuel has practically held the field in parts of Russia, especially in those districts near the Caspian and on the River Volga. This, of

course, is easily to be accounted for. Coal is extremely dear, having to be transported over large distances, whilst the liquid fuel is on the spot. Outside Russia little progress has been made until recently, although there have been numerous experiments; still, something has been done. The British naval authorities have made exhaustive tests, and at the time of writing two battleships, the Mars and the Hannibal, and an armoured cruiser, the Bedford, are being fitted for more extended trials. In the Italian and German Navies experiments have been made, and the German Admiralty have used liquid fuel in the China seas, in lieu of coal, for auxiliary purposes. The Hamburg-American Steamship Company fitted four steamers with liquid fuel, and the North German Lloyd two vessels. The Dutch Navy has had two destroyers fitted with liquid fuel apparatus, whilst Danish shipowners have had two steamers built to burn liquid fuel. Across the Atlantic the United States Bureau of Steam Engineering has been investigating the subject and collecting information on what has been done elsewhere. A sum of £4000 was specially set apart by Congress for making experiments, besides which another sum of about £1500 was available from other appropriations. In addition to this, twenty vessels under the British flag were, at the beginning of last year, running regularly with liquid fuel, and a most extensive organisation has been set on foot by Sir Marcus Samuel, and those connected with him, for the transportation and distribution of liquid fuel.

Sir Fortescue Flannery's paper.

At the Institution of Naval Architects, during the meeting held last spring, Sir Fortescue Flannery read a paper on this subject, in which a good deal of valuable and interesting information was given. In discussing the comparative advantages and disadvantages for war vessels, it was pointed out by the author that the practical figures of comparison between coal and oil fuel showed that two tons weight of oil were equivalent to three tons weight of coal, and 36 cubic ft. of oil were equal to 67 cubic ft. of coal, as usually stored in a ship's bunker. That would mean that if the change of fuel were carried out in an existing war vessel the range of action would be increased by 50 per cent. upon the bunker weight allotted, and nearly 90 per cent. upon the bunker space. Dr. Francis Elgar, the managing director of the Fairfield Shipbuilding Company, has, however, questioned these figures in regard to the Texan oil, quoting certain American shipowners as his authority. He had been told by them that they did not consider it was safe, in the case of Texan oil, to rely upon the higher efficiency which would be given by allowing four barrels or 200 gallons to one ton of coal. That would work out in stowage space at about 32 cubic ft. of Texan

oil for one ton, or, say, 45 or 46 cubic ft. of coal. With regard to the weight, it would appear that about 5 tons of oil are equal to 6 tons of coal. These efficiencies for oil fuel are, of course, not so favourable as those given by Sir Fortescue Flannery, but it may be said that the latter authority, by his connection with the Shell line of steamers, which are devoted to the transport of oil, is in a good position to obtain accurate information. If we take the theoretical calorific value of the best Welsh coal at 15 lbs. of water evaporated per pound of fuel, it would appear, from analyses of the oil fuel quoted by Sir Fortescue Flannery, that the theoretical value of the oil would be about 20 lbs. of water evaporated. This point has been dealt with by Mr. J. Melrose, R.N., who has been engaged upon the experiments made by the Admiralty. Dr. Paul, who has made extensive experiments on this subject, has come to the conclusion that it is not probable that petroleum can be made to evaporate more than 16lbs. of water from and at 212° Fahr. It is, of course, open to question how far the theoretical efficiency of the fuel is approached by coal as compared with oil; that is a matter for experiment and analysis. Coal may be less effectively burnt than oil, or oil than coal. In a paper read by Mr. Edwin L. Orde—an engineer who has had considerable experience with this subject—before the Institution of Mechanical Engineers last summer, it was said that in four mercantile vessels, burning oil, the differences in consumption in favour of liquid fuel as compared to coal were 27 per cent., 28·6 per cent., 35·5 per cent., and 36 per cent. respectively. Mr. Orde concludes from the figures given that it is evident that with a well-designed apparatus it is possible by good management to realise in actual practice the full difference in calorific value between liquid and solid fuel, at rates of evaporation such as are usually obtained in the boilers of vessels of the mercantile marine. At the higher rates of evaporation, such as required in war vessels, the problem becomes more complex.

Smaller engine room staff with liquid fuel.

There is no doubt that many advantages would be gained by the substitution of oil for coal as a means of raising steam. Stokers, as we now understand them, would, of course, be entirely done away with, whilst a limited number of men, corresponding to the leading-stoker class, would attend to the fuel burners. The space required for stokers' accommodation would be set at liberty for other purposes. In one of the Oceanic Steamship Company's vessels, the Mariposa, a ship of 3160 tons gross tonnage, it was found that by substituting oil for coal, the total crew, which was formerly eighty-one men, could be reduced to sixty-five. Another advantage claimed is that replenishing the supply of fuel at sea would be made easy by

the use of oil, there being no difficulty in pumping from a store vessel to a warship in mid-ocean in ordinary weather. Three hundred tons of oil is quite a common rate of delivery, we are told, in the discharge of a tank-steamer's cargo of oil under ordinary conditions of pumping. Whether the transference of liquid fuel could be carried out so easily in a seaway as seems to be anticipated is a matter upon which more experience is desirable before a final opinion can be pronounced.

Corrosion, smoke and explosion.

An evil which undoubtedly now exists with coal, the corrosion of stokehold plates and boiler fronts by damp ashes, would be overcome, as the metal would be actually preserved by the oil. It is further advanced that if liquid fuel is burnt in suitable furnaces with reasonable skill and experience it is smokeless. That may be true as far as ordinary running is concerned, but there is no doubt that many vessels burning liquid fuel give forth at times large volumes of dense and extremely offensive smoke. The Surly, which was used at Portsmouth for experimental purposes, was for a time notorious in this respect. With experience that defect may be overcome, and it must be remembered that the Surly was only experimenting. It is when stopping and starting that there is most likelihood of making smoke. There is also danger that through leakage into a warm fire-box oil-gas may accumulate and lead to an explosion. The sudden failure of the oil jets, which may be caused by water or by obstruction of the strainers or supply pipes, will also lead to an accumulation of gas in the furnace. In addition to this there is a chance of gas being allowed to accumulate in the supply tanks, and this gas would be a source of danger, and would have to be removed by mechanical means, otherwise a light or electric spark might cause explosion. There is another respect in which liquid fuel is inferior to coal for warship purposes. It would be carried for the most part below the water-line, if not wholly in the double bottom. That in itself would present advantages, but the protection against projectiles given by "coal armour" would be lost. How far this is a defect is a matter for naval officers to decide; for it is doubtless somewhat risky to trust to coal protection when the coal might not be present. These points, and others, relating more particularly to mercantile vessels, are well discussed in Sir Fortescue Flannery's paper, to which reference may be advantageously made by those interested in the subject.

Natural mineral oil is made up of substances of various natures.*

* Mr. Orde in his paper read before the Institution of Mechanical Engineers at the Newcastle meeting of 1902 dealt with the composition chemical of liquid fuels generally used.

The more volatile constituents are too valuable to be used as fuel, and it is the residuum—sometimes known as heavy oil, or in Russia as "astatki"—that is available for steam raising. It is a thick, treacle-like liquid, too stiff to be burnt except after disintegration. It may be either pulverized by steam or injected under pressure, so that it breaks up against an obstacle at the mouth of the furnace. Mr. Orde says that very few mechanical spray burners have achieved success. It is obviously difficult to mechanically spray a material so viscous as fuel oil. The most successful burner of this type is the Korting. It is claimed by some that it may be vaporised by heat before the furnace mouth is reached; but the American naval authorities lay special stress on the need for atomizing the oil, as it is impossible, they say, to completely gasify it before ignition. The steamship Murex has been fitted with a direct steam pulverizing type of furnace. She made last year a voyage of 11,800 miles from Singapore. The consumption of coal in this vessel had averaged 25 tons, but this weight of fuel was reduced to 16 tons of oil when the change to liquid fuel was made. In the system introduced by Mr. James Holden, the Chief Locomotive Engineer of the Great Eastern Railway, both coal and oil are burnt simultaneously, or rather there is coal on the grate, above which the oil is injected by steam. So long as the oil supply is continued, however, the consumption of coal is very small, as air is carried in with the oil fuel, whilst the solid fuel remains largely in an incandescent state. This system has been applied with considerable success to locomotives running on the Great Eastern line, but coal having been cheaper than oil any extensive adoption of the system has not taken place. In some systems of burning oil the fire-bars are left in place, and are covered with a layer of broken fire-brick. This can easily be removed, and coal substituted if the change to solid fuel is desired. In one case mentioned by Sir Fortescue Flannery, within 28 minutes of steaming full speed under oil the vessel was steaming full speed with coal. A drawback to the use of liquid fuel by the steam pulverizing method is the loss of fresh water from the boilers. The consumption of steam is given by Sir Fortescue Flannery at 0·2 lb. per I.H.P. per hour. In some American experiments given in the Annual Report of the U.S. Bureau of Steam Engineering the steam estimated to be used for spraying was variable, ranging in different trials from 1 to 8½ per cent. of the total generated. More information is needed to draw conclusions as to the conditions which govern this very wide variation in steam economy. An additional demand for fresh water might throw a good deal of work on the evaporators of vessels steaming at high speed.

In four of the Hamburg-American Company's steamers another method has been applied. The oil is heated to about 60° Cent., and then passes through a pump, being delivered to another heater, which raises its temperature to 90° Cent. It is then injected into the furnace under a pressure of 30 lbs. to the square inch. A spiral motion is given to the jet by means of a deflecting needle, and in this way the oil, which has been rendered more liquid by the heating, is caused to spray and ignite. Another system, the Meyer system, which has been adopted by the Dutch Steam Packet Company, is also used without any demand on the boilers for steam. It depends largely upon the assistance to combustion which is afforded by air heated previously to its meeting the liquid fuel. Here also whirling action is employed to promote combustion. Methods of injection by means of compressed air have also been tried. Some years ago Messrs. Doxford, of Sunderland, built a torpedo boat which was equipped with oil-burning apparatus, and which answered very well. In this case steam injection was not used, the oil fuel was carried in tanks, in which a considerable pressure of air was maintained by means of compressors.

It will be remembered that a year or two ago Mr. A. F. Yarrow fitted some first-class torpedo boats, built for the Dutch Navy, with oil-burning apparatus. In this case, however, the oil fuel was to be used as an auxiliary, more especially in the case of long runs when fires became dirty, so that the steam-generating power of the coal could be supplemented by the oil. It was found by experiments that when the fires became dull and required cleaning, so that the speed would fall off about two knots, the original rate of steaming could be regained by turning on the oil fuel. Mr. Yarrow's oil-burning torpedo boats.

In the United States the burning of liquid fuel for marine purposes has received a good deal of attention, as will be gathered from what has been said. Admiral Melville agrees with Mr. Orde in regard to the problem of using liquid fuel in war vessels being quite distinct from that of its application to mercantile purposes. Still the experience gained in merchant ships is naturally of great value. Engineer officers of the United States Navy have visited and reported on oil burning installation in several mercantile vessels on both the Atlantic and Pacific coasts. Admiral Melville has come to the conclusion that the more the question is investigated the more intricate seems the problem of successfully installing oil fuel appliances on board a battleship. It may, he says, be useful on torpedo boats and on auxiliary vessels, but there is a distinction between these craft and ocean-going ships, and the duties they respectively perform are widely different. It is necessary, it is said, that for efficient, Admiral Melville on oil fuel.

economical, and rapid burning of liquid fuel the oil must be atomised. The efficiency of a burner is simply proportionate to its power to atomise the oil, and then turn those minute particles into a mixture of combustible gas and fine carbon, so that complete combustion can be secured. Provision must be made for heating the oil, and for heating the air required for combustion. Amongst the further tests proposed by Admiral Melville are a series which will show the evaporative efficiency that is secured when admitting air to the furnace at different degrees of temperature.

It may be added to this that room for combustion in the fire box is a prime necessity for oil burning, and in this respect water-tube boilers of the Thornycroft or Yarrow type should be eminently suitable for the purpose.

G. R. DUNELL.

CHAPTER VII.

Foreign Manœuvres.

France.

The French manœuvres of 1902 were in many ways more important than those of the previous year, which had attracted a great deal of attention because of the interesting problems involved. The essential feature was again a struggle for the command of the western basin of the Mediterranean, and the various exercises covered most of the conditions which would arise from a conflict of forces in those waters. In the first period of operations the object of the French defending fleet was to defeat the purposes of an enemy, represented by the Northern Squadron, who sought to enter the Mediterranean from the Atlantic. In the second period there were interesting tactical exercises, and a naval attack upon Bizerta. The third period was devoted to the strategical manœuvres of opposing squadrons in the region between Toulon, Ajaccio, and Bizerta, including a blockade of Toulon, and an engagement off the Iles d'Hyères, and the fourth period was given up chiefly to battle tactics. Vice-Admiral Gervais was for the third time *admiralissimo* or director of the manœuvres, thus exercising the functions for the last time before reaching the limit of age. He had his flag in the battleship Bouvet with the destroyer Hallebarde attached as a despatch boat. The Vice-Admiral selected as chief of his staff the late Rear-Admiral Merleaux-Ponty, whose death, not long afterwards, was a great loss to the French Navy. That officer had been greatly concerned in the organisation of the defences of Bizerta.

The following was the composition of the squadrons engaged in the first period of the manœuvres.* It does not appear that the plan of assigning a numerical value to the ships was adopted, though its value had become apparent in the operations of 1901.

* To make what follows clearer, the plan has been adopted of putting in italics the names of ships representing the French force, while those of the enemy are in small capitals.

Forces engaged.

MEDITERRANEAN SQUADRON (FRENCH).—Vice-Admiral de Maigret.

First Division.—Battleships: *Saint Louis* (flag), *Charlemagne*, *Gaulois*.
Second Division.—Rear-Admiral Marquis: *Iéna* (flag), *Jauréguiberry*.
Reserve Division.—Rear-Admiral Besson: *Brennus* (flag), *Hoche*, *Masséna*, *Carnot*.
Cruiser Division.—Rear-Admiral Boutet. Armoured cruisers: *Pothuau* (flag), *Chanzy*, *Latouche-Tréville*, *Amiral Charner*. Protected cruisers: *Cassard*, *Du Chayla*, *Galilée*, *Linois*. Despatch vessel: *Dunois*.
Torpedo Flotilla.—Destroyers: *La Hire*, *Pique*, *Condor*, *Espingole*, *Epée*, *Flibustier*.

NORTHERN SQUADRON (ENEMY).—Vice-Admiral de Courthille.

First Division.—Battleships: FORMIDABLE (flag), COURBET.
Second Division.—Rear-Admiral Péphau. Coast defence armour-clads: BOUVINES (flag), AMIRAL TRÉHOUART, JEMAPPES, VALMY.
Armoured cruisers: DUPUY DU LÔME, MONTCALM.
Torpedo gunboat: CASSINI.
Destroyers: DURANDAL, FAUCONNEAU, YATAGAN.

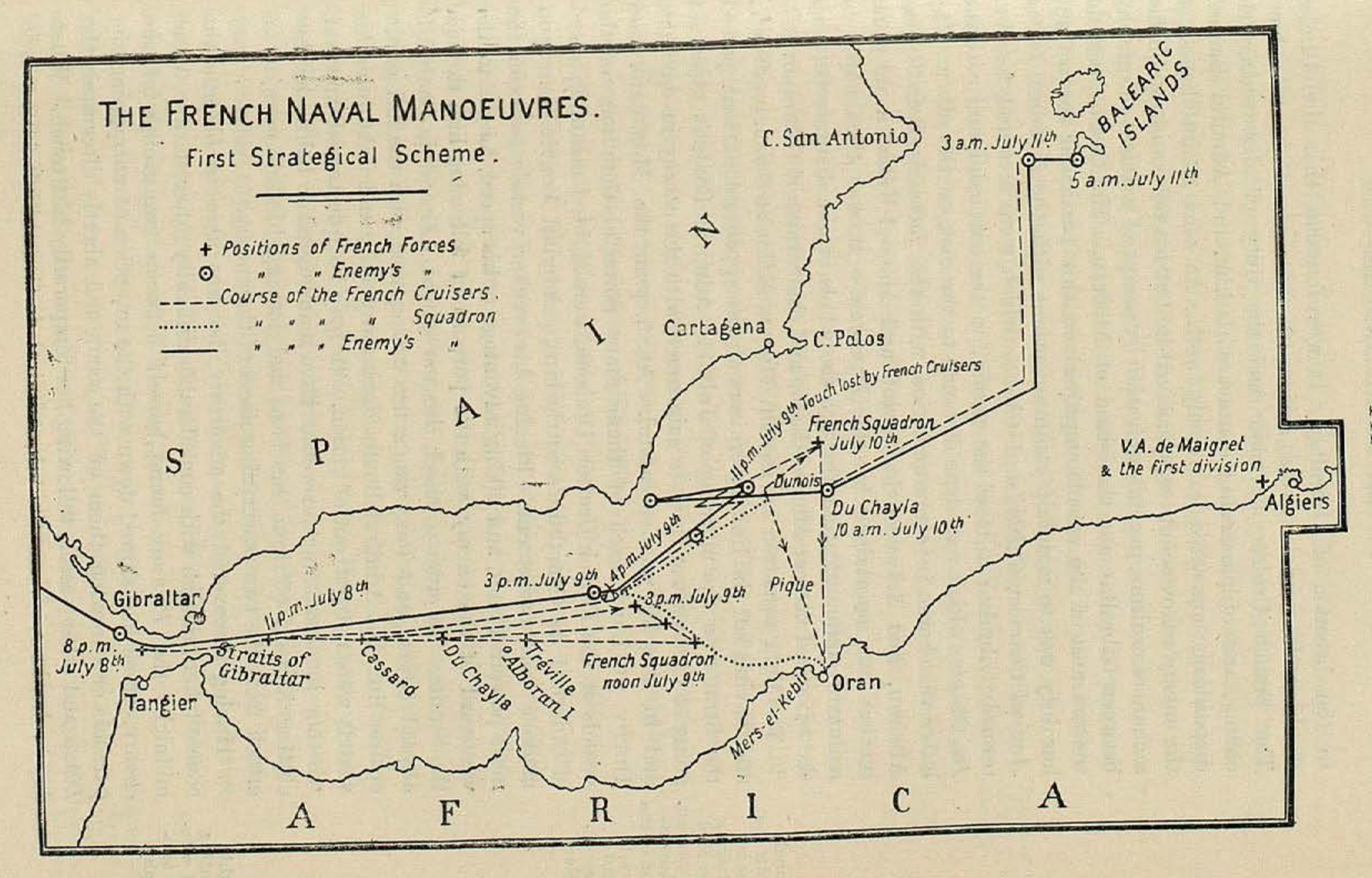
It will be observed that the enemy's squadron was greatly inferior, both in numbers and speed, and that, although it had two fine cruisers, it was for practical purposes destitute of scouting vessels.

First strategic scheme.

The Mediterranean Squadron represented a French force, which, in the period of tension preceding hostilities, had taken up its position at Algiers, with its Second and Cruiser Divisions advanced to Mers-el-Kébir, with the purpose of watching the approach from the Atlantic. The Northern Squadron, representing the enemy, had left Brest on June 30 for Lisbon, and, departing from that place, was to endeavour to pass the Straits of Gibraltar, and would be regarded as having succeeded in its further object if it reached the Balearic Islands by 5 a.m. on July 15. It was known to the French side that Vice-Admiral de Courthille would leave Lisbon on July 7, and his speed, and the time and place of departure and destination being ascertained, the task of observation was to some extent simplified. It has been assumed that the Northern Squadron was intended to represent a British force attempting to effect a union with the British Mediterranean Squadron, but the fact that Gibraltar was regarded as neutral, and that the French cruisers passed through without any apprehension of attack, seems conclusive against the accuracy of that view. The manœuvre must therefore be looked upon as a strategic exercise, having for its object the observation of a sea passage from an advanced base, and the maintaining of contact with the forces discovered, pending the arrival of the main force to bring them to action.

Opening of hostilities.

The French at Mers-el-Kébir learned, on July 7, that hostilities had begun, and at 8 a.m. received intelligence that the enemy's squadron had been sighted off the Portuguese coast, proceeding


THE FRENCH NAVAL MANOEUVRES.
First Strategical Scheme.
+ Positions of French Forces
⊙ " " Enemy's "
----Course of the French Cruisers.
.... " " " " Squadron
——— " " " Enemy's "
SPAIN
AFRICA
C. San Antonio
Cartagena
C. Palos
BALEARIC ISLANDS
3 a.m. July 11th
5 a.m. July 11th
11 p.m. July 9th Touch lost by French Cruisers
French Squadron July 10th
Dunois
Du Chayla 10 a.m. July 10th
V.A. de Maigret & the first division
Algiers
Pique
Oran
Mers-el-Kebir
3 p.m. July 9th
4 p.m. July 9th
3 p.m. July 9th
French Squadron noon July 9th
Tréville
Alboran I
Du Chayla
Cassard
11 p.m. July 8th
Gibraltar
8 p.m. July 8th
Straits of Gibraltar
Tangier

in the direction of Gibraltar. It was foreseen that the Admiral would endeavour to avoid action in order to attain his object. The French Cruiser Division had the duty of discovering the enemy, and of preserving contact with him, and Admiral Boutet's dispositions answered extremely well. As soon as intelligence of the enemy's movements was received he left his port, and established a chain of cruisers, in communication by means of wireless telegraphy, between Gibraltar and the island of Alboran. The *Cassard* was the westernmost of the vessels employed on this particular service, and her duty was to maintain communications with the *Pothuau*, *Linois*, *Amiral Charner*, *Galilée*, and *Chanzy*, which were steaming together towards Gibraltar to meet the enemy, on the one hand, and with the *Du Chayla*, which was some distance to the east, on the other. The latter vessel was in communication with the *Latouche-Tréville* near Alboran, and between that point and Mers-el-Kébir, a despatch service was maintained by the *Espingole*. It was thus hoped to maintain communication through the whole of the distance between the advanced base at Mers-el-Kébir and the Straits of Gibraltar.

Touch with the enemy entering the Mediterranean. Observation of the Straits from Mers-el-Kébir.

The light squadron having left Mers-el-Kébir at 8 a.m. on July 7, and having left the linking cruisers at the appointed stations, passed the Straits on the morning of July 8. Admiral Boutet's object in going so far westward was to gain touch with the enemy in daylight, and in this he was successful. At 5 p.m. the MONTCALM and DUPUY DE LÔME, each of them more powerful than any of the vessels of the French Cruiser Division, were sighted steaming ahead of Admiral de Courthille's battleships. Admiral Boutet thereupon made a bold movement. Placing his weaker vessels between the more powerful ones, and taking advantage of his speed, he got to the westward of the enemy, with the purpose of following him through the Straits. In order to check this movement, Admiral de Courthille altered course, and long range fire was opened with the tail of the cruiser line, but Admiral Boutet drew away, and, under the rules, his vessels were not put out of action. It may be questioned, however, whether in actual war he would have manœuvred so boldly in thus cutting himself off from his base and leaving himself open to an attack from the two powerful cruisers of the enemy.

Night scouting and wireless telegraphy.

Having discovered the adversary, he was able to observe the course taken, though with considerable difficulty, after dark. About midnight the *Pothuau* found herself between two groups of the enemy, which had slowed down with the intention of entrapping the pursuers or throwing them off the scent, and shortly afterwards the *Linois* and other vessels following her temporarily lost touch. When day broke, however, on the 9th, Admiral de Courthille's force was in

view, and the defending cruisers had been thus far successful. Meanwhile, at about 11 o'clock on the previous night, the *Cassard* had received intelligence by wireless telegraphy that the enemy had been sighted, and the information was transmitted through the *Du Chayla* to the *Latouche-Tréville*, whereupon the *Espingole* proceeded at full speed to Mers-el-Kébir in order to inform Rear-Admiral Marquis of what had happened. Upon receiving this information the rear-admiral immediately left with the *Iéna, Jauréguiberry, Pique*, and eight torpedo boats of the mobile defence of Oran, having the *Dunois* as their leader, and shaped his course towards the island of Alboran.

Progress of the enemy.

While this movement was in progress, Admiral de Courthille had made considerable progress a little to the north of east, and about noon on the 9th was steaming some miles to the north of Alboran. As he advanced, the *Cassard, Du Chayla* and *Latouche-Tréville*, which had been in the wireless telegraphy cordon, fell back towards the battleship squadron, with the object of preserving communication with Admiral Boutet's main body of cruisers, then following the enemy in his advance, and Rear-Admiral Marquis altered course according to the information he received. A temporary failure of the wireless telegraphy caused some trouble. The torpedo boats were also sent ahead towards the enemy, but this measure may be justly criticised, since their presence should have been concealed until the night. As it was, they were observed, and were unable to take any part in the operations which followed.

At 3 o'clock in the afternoon Rear-Admiral Marquis was in the vicinity of the enemy, who came on in line ahead with the MONTCALM and DUPUY DE LÔME on either side of the leading ship. A long way off on the port side followed the French Cruiser Division, maintaining touch with him as he advanced, although the MONTCALM and the DUPUY DE LÔME might probably have dealt heavily with it. It seems certain that in actual warfare these cruisers would have been dispersed or destroyed. The battleship squadrons were cleared for action, and the FORMIDABLE opened fire, but when Rear-Admiral Marquis had had an opportunity of recognising the inferiority of his force, he altered course, and, thanks to his superior speed, which under the rules was 12 knots as compared with the enemy's 10, he was able to escape, and the DU CHAYLA was despatched at full speed to Algiers to inform Admiral de Maigret of what had happened.

Admiral de Courthille shakes off his pursuers.

A new phase of the manœuvres now began. Admitting the bold action of Admiral Boutet to have been justified by its success—though few can conclude that in war such would have been the case—it will be seen that the French Cruiser Division had so far

attained its object, for it was still hanging on the heels of the enemy. At nightfall on the 9th, Admiral de Courthille was steaming north-east at 10 knots, making a direct course towards the Island of Formentera, with Cape de Gata broad on the port hand. The squadron was in line ahead, with the two cruisers astern, while the French cruisers, in a compact formation for safety, were steaming well in view on the starboard hand.

As the dusk came on the torpedo boats from Oran, led by the *Dunois*, which had been full in sight of the enemy most of the day, came up between the observing cruisers and Admiral de Courthille's battleships, while the *Pique* and *Epée* also took an advanced station, with the purpose of maintaining contact as the darkness increased. The night was clear, and a crescent moon was in favour of the pursuers. The vessels carried no lights, and Admiral de Courthille steamed ahead, as if regardless of the enemy following him, but at ten o'clock the moon disappeared, and the obscurity was then complete. From time to time the pursuers discerned lights in the enemy's squadron, which were supposed to be accidental, but in reality Admiral de Courthille was practising a ruse. In the course of the night he altered course to the west, approaching Cape de Gata, but still showing a light in the last ship of his line, which long continued to mask his movement. At length it became apparent in the *Pothuau* that he was likely to escape, and the cruisers were signalled to alter course to the westward, but the light disappeared, and from that time onward uncertainty shrouded the enemy's movements. Indecision now characterised the operations of the pursuers. The *Pothuau* lost touch with the *Pique* and *Epée*, and the observing organization was broken up. The *Pique*, however, stuck resolutely to the enemy's line, though from time to time discovered by searchlights and fired upon, and when day broke on July 10, the destroyer and the *Dunois* also, by something like an accident, were still observing the course taken. The MONTCALM, however, immediately proceeded to drive them off, for they were wholly unsupported, and thus Admiral de Courthille was completely successful in evading his pursuers. Meanwhile, the torpedo boats, which had been absolutely useless, partly owing to the unskilful way in which they had been handled, and partly to the unexpected movement of Admiral de Courthille, had proceeded to Oran, which had been left unprotected. In the course of the operations these useless craft had altogether lost touch with their leader, the *Dunois*, which had endeavoured to place them in an advantageous position for attack, and the complete failure seemed to require explanation. It was remarked that there had been a neglect of obvious precautions against dispersion

of force, and that the boats of the mobile defence had not shown the qualities that were expected of them.

Success of the enemy.

At about ten o'clock on the morning of the 10th Rear-Admiral Marquis assembled his scattered forces at an appointed rendezvous, and proposed to organise a new system of search. Chance favoured him, for the *Du Chayla*, by what appeared a pure accident, sighted the enemy's squadron steaming eastward, and thus contact was regained when Admiral de Courthille was about midway between Cape Palos and Oran. The day passed much like its predecessor, the cruisers again following the squadron at a discreet distance, but too much time had been lost, and the prospects of the French side were desperate, since it was practically impossible to effect any useful operation in conjunction with Admiral de Maigret's forces, which were still awaiting developments at Algiers. The manœuvres were to end on the next morning, and the French Commander-in-Chief therefore thought it unnecessary to leave his port. That night Admiral de Courthille inclined his course towards the north, his adversary's cruisers still following, but in much disorder, and complete success attended his movements. He therefore proceeded with his force to Mers-el-Kébir, and Admiral Gervais, in the Bouvet, having witnessed the manœuvres, accompanied him.

Some reflections.

It is to be regretted that the exact value assigned to the vessels engaged has not been disclosed, and that some conditions influencing the course of the manœuvres are unknown. A precise knowledge of the circumstances would no doubt have enabled valuable lessons to be drawn. The rules or conventions laid down seem to have taken something of practical significance from the operations in this stage. A writer in the *Moniteur de la Flotte*, to whom some of the particulars given are due, remarked that direct umpiring might have led to more interesting conclusions. It would appear that the actual lessons drawn from the manœuvres at the Admiralty in Paris are not revealed either to the public or the officers who take part in the operations, and the writer in question says he has never met anyone who has seen the official report upon the manœuvres of 1900. These official deductions would seem, therefore, to remain the mysterious fruit of the meditations of the supreme chiefs of the Navy, and not to be intended for the instruction of officers in general. There can be little doubt that Admiral Boutet acted in a manner, and suffered an immunity, which did not represent the conditions of war. Wireless telegraphy had given excellent results, which were to be emphasised later on, and had been successfully employed by the chain of cruisers. Almost for the first time in the French Navy the system was shown to have real and practical value,

with a large use in strategic movements. This was one important result of the manœuvres. The cruisers, if they had acted too boldly, had shown a right understanding of their duties in the conditions in which they were placed, and it was the first occasion on which they had been employed in a manner that did approach somewhat to that which would be adopted in actual hostilities. Their partial failure seemed to indicate the need of more careful training for co-operation in their work. Night operations had played a large part, and it had been shown that much has yet to be accomplished before the cruisers can act effectually in maintaining contact with an active enemy. It appeared that a chief danger to be guarded against was that of being entrapped by a clever ruse, and of being destroyed by the sudden concentration of superior forces.

Engagement at Cherchell.

The second period of operations began on July 15, when the Northern Squadron left Mers-el-Kébir to encounter the Mediterranean Squadron. The two forces met, through the use of wireless telegraphy, near Cherchell, off Cape Blanco, on the African Coast, on the next day. The object was to practise battle tactics, and Admiral Gervais was with Admiral de Courthille in the action that followed, the Bouvet reinforcing the Northern Squadron, which had six battleships, steaming at 11 knots, opposed to the nine of the Mediterranean Squadron, with a speed of 13 knots, and the Amiral Charner was added to the Northern Squadron, bringing up the number of armoured cruisers to three. The cruisers, however, drew away from the battleships, and did not take any part in the main action. When the engagement opened the Northern Squadron was formed in line ahead, while the Mediterranean Squadron was approaching it upon an oblique course in quarter line. Fire was opened at 5000 mètres as the two squadrons rapidly neared, and when Admiral de Maigret had approached within 2000 mètres he signalled to the ships to alter course together, thus bringing them into line ahead upon a course parallel to that of Admiral de Courthille. Then followed a series of movements in which Admiral de Maigret, by using his higher speed, endeavoured to envelop the Northern Squadron, and to bring it between two fires. Admiral de Courthille, however, by altering course to starboard, as his adversary came round on the port side, defeated this purpose. The manœuvres appear to have been executed with precision, though the Mediterranean Squadron was at one time rather disordered. The action lasted an hour, and at the end of it Admiral de Maigret's superiority in speed of 2 knots had not given him the tactical advantage he was endeavouring to secure. One French critic has pointed out that it would, therefore, be a mistake to attach too much

importance as to the tactical value of superior speed, unless the advantage should be very considerable.

At the moment when the two squadrons were nearest to one another, the torpedo boats from Oran, now attached to the Northern Squadron, appeared, intending to attack, but the Mediterranean destroyers engaged them, and an action ensued in which the destroyers of the Northern Squadron were also employed. It appears to have been impossible to arrive at any conclusion as to the result of this minor action. The cruisers had also been in action, and the DUPUY DE LÔME had led the light division of the Northern Squadron round the stern of the Mediterranean line with such rapidity that it had fallen upon Admiral Boutet's division, then in very inferior force, and had taken it at a decided disadvantage. In the course of this action some of the smaller cruisers were very rashly exposed, and in actual hostilities would certainly have been destroyed. The Cruiser Division of the Northern Squadron appears to have been admirably led.

Attack on Bizerta.

On July 16, and the three following days the combined fleet was engaged in steam tactics and signalling exercises, and on the evening of the 19th the whole force anchored with great precision at Bona. An attack upon Bizerta followed. The fleet left Bona on July 21, and, after some tactical exercises, in which various novelties are said to have been tried, approached the port, which the light squadron reconnoitred. The defences had been mobilised on a war footing in the afternoon of the 22nd, and the attack is stated to have been one of the most interesting operations of the manœuvres. Inasmuch, however, as the details have been concealed, it is perhaps unnecessary to describe what took place at any length. The torpedo flotilla reconnoitred the place, but was discovered and brought under fire. A misunderstanding between two divisions of boats resulted in one party firing upon its friends, which may suggest some of the dangers of such operations. On the 22nd the battleships, formed in four divisions, opened fire upon the works of the port at 2000 mètres, steaming to and fro. It would scarcely appear that this operation had any value, for it is not the business of battleships to engage strong shore defences.

Coaling took place on the 23rd, and at night Admiral de Maigret put to sea with his squadron. The light division coaled on the 24th, and the *Pothuau*, *Chanzy*, *Latouche-Tréville*, and *Cassard* left the port for Ajaccio, where they expected to find the Mediterranean Squadron. Admiral de Maigret then proceeded to the Straits of Bonifacio, where his squadron was to be attacked at night by the mobile defence of Corsica. It was a clear night, and the boats were

entirely foiled in their attempt to discover the squadron, and in the morning were attacked by the Mediterranean destroyers and put out of action.

The second strategic scheme.

The third period of the manœuvres, which was mainly strategical, was more interesting than the preceding periods. The fleet was reconstituted to represent adversaries contending for superiority in that portion of the Mediterranean lying between Toulon and Bizerta, the eastern side of the manœuvre area being bounded by Corsica and Sardinia, and the western by the meridian of Toulon. Admiral de Courthille was now in command of the force which represented the French fleet, and Admiral de Maigret of that which represented an adversary, that adversary being, we may suppose, the British Mediterranean Squadron, or a portion of it. The following was the composition of the fleet* :—

Distribution of forces.

The French Squadron.—Vice-Admiral de Courthille (Bizerta).

A.

Formidable, Courbet, Amiral Tréhouart (representing a battleship squadron).
Casabianca, Flèche, Yatagan, scouting vessels.
Tempête, Phlégéton (the naval division of Tunis).
Torpedo boats of the mobile defence of Bizerta.

D (completing mobilisation at Toulon).

Brennus, Hoche, Carnot, Masséna, battleships.
La Hire, destroyer, and the *torpedo boats and submarines of Toulon.*

The Enemy's Squadron.—Vice-Admiral de Maigret.

B (observing squadron).—Rear-Admiral Péphau.

Bouvines, Valmy, Jemappes, battleships.
Dupuy de Lôme, Montcalm, Amiral Charner, Du Chayla, Cassini, scouting vessels.
Durandal, Fauconneau, destroyers.

C (Ajaccio).

Saint Louis (flag), Charlemagne, Gaulois, Iéna, Jauréguiberry, battleships.
Pothuau, Latouche-Tréville, Chanzy, Cassard, Linois, cruising vessels.
Dunois, Epée, Espingole, Pique, and the mobile defence of Corsica.

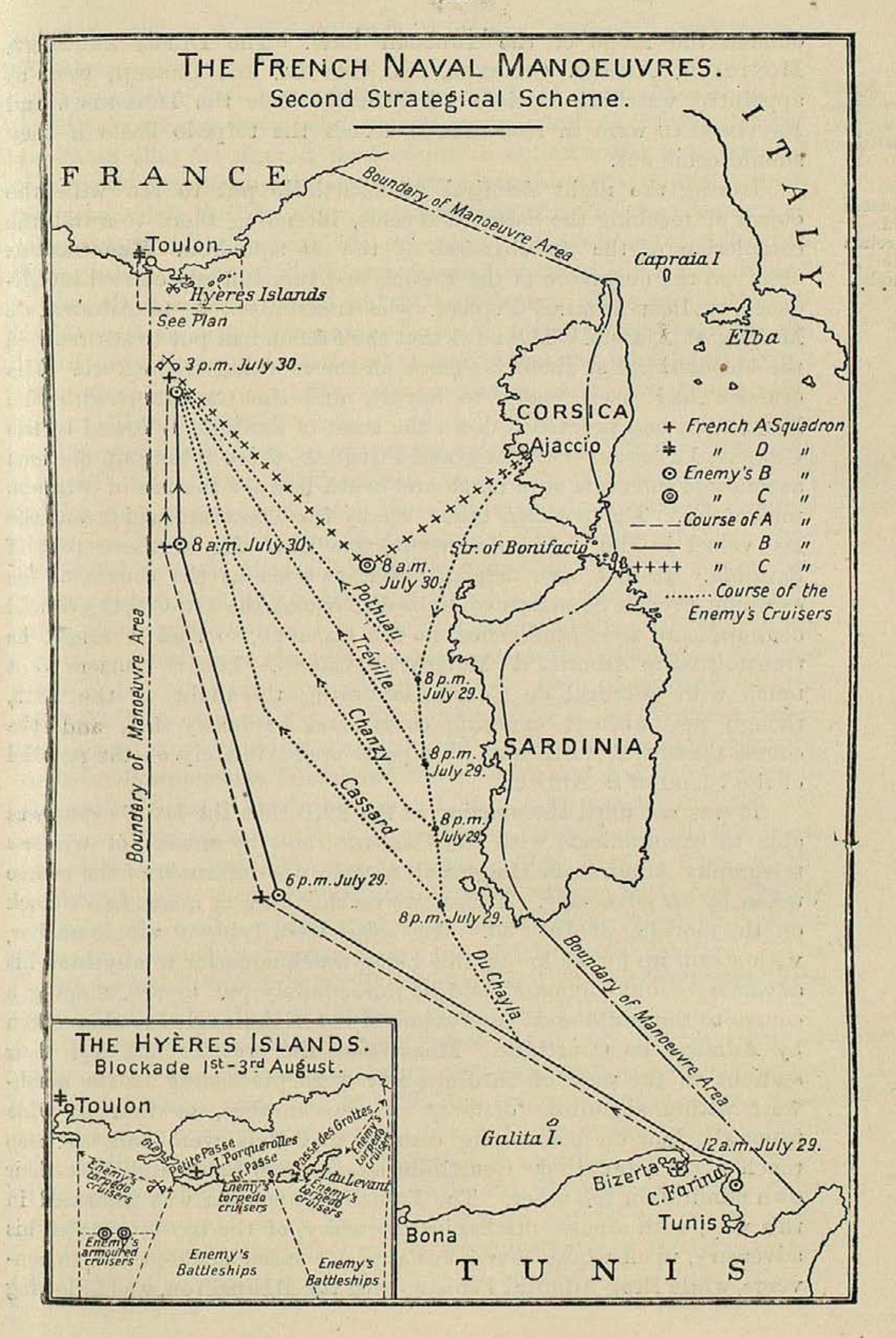
With Admiral Gervais (neutral).

Bouvet, battleship; Galilée, cruiser; Hallebarde, despatch vessel.

Plan of operations

The object of the French admiral was to unite the *A* and *D* divisions, and that of the adversary to defeat this purpose, and, if possible, to attack the *A* squadron before it could join the ships of the *D* squadron, then mobilising at Toulon. Hostilities opened at 6 p.m. on July 28, Admiral de Courthille being then at Bizerta and Rear-Admiral Péphau, with the B observing squadron, anchored at Porto Farina,

* In describing this second strategical operation, the fleet having been given new formations, the ships of the French force are again named in italics, and those representing the enemy in small capitals. This indication has no relation to the like indication in the description of the first strategic scheme, in which the vessels were otherwise disposed.


THE FRENCH NAVAL MANOEUVRES.
Second Strategical Scheme.
FRANCE
ITALY
Boundary of Manoeuvre Area
Toulon
Hyères Islands
See Plan
Capraia I
Elba
CORSICA
Ajaccio
3 p.m. July 30.
8 a.m. July 30
8 a.m. July 30.
Str. of Bonifacio
+ French A Squadron
" D "
Enemy's B "
" C "
Course of A "
" B "
++++ " C "
.... Course of the Enemy's Cruisers
Pothuau
Tréville
Chanzy
Cassard
Du Chayla
8 p.m. July 29.
8 p.m. July 29.
8 p.m. July 29.
8 p.m. July 29.
SARDINIA
6 p.m. July 29.
Boundary of Manoeuvre Area
Boundary of Manoeuvre Area
Galita I.
12 a.m. July 29.
Bizerta
C. Farina
Tunis
Bona
TUNIS
THE HYÈRES ISLANDS.
Blockade 1st-3rd August.
Toulon
Giens
Petite Passe
I. Porquerolles
Gr. Passe
Passe des Grottes
I. du Levant
Enemy's torpedo cruisers
Enemy's torpedo cruisers
Enemy's torpedo cruisers
Enemy's torpedo cruisers
Enemy's armoured cruisers
Enemy's Battleships
Enemy's Battleships

outside the range of the Tunisian forts. The DUPUY DE LÔME, MONTCALM, AMIRAL CHARNER, DU CHAYLA, and CASSINI, were at appointed watching stations off Bizerta, while the DURANDAL and FAUCONNEAU were in readiness to attack the torpedo boats if they should come out.

The cruisers and wireless telegraphy.

During the night Admiral de Courthille put to sea with the object of reaching the Salins d'Hyères, intending there to await the completion of the mobilisation of the *D* squadron. The CASSINI observed the departure of the French, and immediately carried intelligence to Rear-Admiral Péphau, who transmitted it to Admiral de Maigret at Ajaccio. The news that the French had put to sea reached the vice-admiral at about 3 o'clock on the morning of the 29th. His cruisers had been ready to depart, and the CASSARD, with the ESPINGOLE, had proceeded down the coast of Sardinia, followed by the CHANZY, LATOUCHE-TRÉVILLE, and POTHUAU, these taking up stations at suitable intervals on a north and south line for the use of wireless telegraphy. The position taken up by the CASSARD, which was the last vessel in the chain of cruisers, was near the southern part of Sardinia. It had been arranged that as soon as the course of the escaping French Squadron could be discovered, the DU CHAYLA should communicate the intelligence to the CASSARD, so that it might be transmitted to Admiral de Maigret at Ajaccio. The B cruisers kept touch with Admiral de Courthille during the night of the 28th, though not without exposing themselves to heavy fire, and the course taken was north-west to a point approximately on the parallel of the island of S. Antioco.

It was not until the evening of the 29th that the DU CHAYLA was able to communicate with the CASSARD, and by means of wireless telegraphy Admiral de Maigret at Ajaccio was informed of the course taken by his adversary. This news reached him at about two o'clock on the morning of July 30. His ships were lying at single anchor, with steam up for 15 knots, this being much superior to anything his adversary could command, and he immediately put to sea, shaping a course to the south-west approximately at right angles to that taken by Admiral de Courthille. Meanwhile, the cruisers had left their stations on the west of Sardinia, and were proceeding to the north-west within signalling distance of one another, at first at wide intervals, but on converging courses, and thus were able to keep touch with Admiral de Courthille on the one hand and with their own admiral on the other. The French commander was informed in this way, with almost mechanical accuracy, of the movements of his adversary, upon whose course his superior speed enabled him to converge, while Rear-Admiral Péphau, with the B squadron, was following

Admiral de Courthille in his progress towards the Salins d'Hyères.

The *A* squadron brought to action.

If the latter had been allowed to steam at more than 10 knots, he might perhaps have been able to escape, but, as it was, it was inevitable that he should be brought to action. He was pursued throughout the day by the DUPUY DE LÔME, MONTCALM, and AMIRAL CHARNER, while full in sight, on the starboard, was the CASSARD, in direct communication with his adversary. The opposing squadrons sighted one another in the afternoon, and at three o'clock *A*, B, and C were all cleared for action and ready to begin. Admiral de Maigret manœuvred in such a manner as to bring his adversary between the B and C squadrons, but Admiral Gervais, who had joined the French side, signalled a cessation of hostilities, and the theme was temporarily interrupted.

Blockade of the Salins d'Hyères.

The night was given up to various exercises, the ships manœuvring without lights, and the problem was again the maintenance of communications in such conditions, while the destroyers of B and C made an attack upon the *A* squadron. The combined force then proceeded towards the Salins d'Hyères, and the opposing forces were reconstituted according to the original scheme, Admiral de Courthille, with whom was Admiral Gervais, proceeding to the anchorage in the Salins. Admiral de Maigret thereupon organised his forces in three groups to blockade the position. The first, composed of the *A* battleships, cruised ten miles to the south of the Grande Passe; the second, constituted of the armoured cruisers, at the same distance, between Porquerolles Island and Cape Sépet, and the third group to the south of the Passe du Levant. Lights were masked, and the men were at their night stations in readiness for torpedo attacks, while the destroyers watched the passages. The French force at the anchorage also took precautions against attack from the mobile defence of Corsica, which was with the attacking force, and picket boats and destroyers were steaming to and fro until daybreak. The night passed, however, without incident, and on the next day there was a bombardment of the forts at the Salins d'Hyères.

Junction of the French Squadrons

The principal incident took place early on the morning of August 3. The *D* squadron, being now supposed to have completed its mobilisation, came out from Toulon before daybreak, drove away the enemy's cruisers, and entered the harbour of the Salins through the Petite Passe, where it joined the *A* squadron. The wisdom of this course may be questioned. If the two French Squadrons, which were in communication, had been able to put to sea in the night and at the same hour, they might have united at a rendezvous, and have found an opportunity of falling in superior force upon some of

the blockading divisions and of defeating one or more of them in detail.

The battle off Toulon.

The united *A* and *D* squadrons now put to sea, coming out through the Grande Passe, whereupon the adversary's forces concentrated as rapidly as possible and took a formation in two lines abreast, with the cruisers in two groups on either hand. There does not appear to have been any purpose of avoiding action. *A* and *D* were in single line ahead, steaming westward, when the action opened. It appeared to be the purpose of Admiral de Maigret to keep his battleships concentrated as much as possible, with the purpose of bringing to bear a crushing fire upon the head of the line, while Admiral de Courthille endeavoured, by manœuvring, to lead his adversary under the fire of the shore guns. The cruisers at the starboard end of Admiral de Maigret's line came into action with the sternmost ships, and the other cruisers steamed to their aid, while the *D* squadron (French) was also engaged on the port side by the battleships. Its chief, therefore, altered course to the eastward, in order to bring its starboard guns to bear upon his adversary's cruisers. The action was brought to an end by the *A* squadron taking refuge under the batteries of the Giens Peninsula, and Admiral Gervais signalled a cessation of hostilities. It must be confessed that a good deal is wanting to a full understanding of the special tactics employed.

Battle tactics.

We now come to the last period of operations, which began on August 4, and was devoted to steam tactics and the study of battle formations. The various movements were executed by the Mediterranean Squadron at 15 knots with great precision, and it would appear that the ships were well handled and kept station to the satisfaction of the admiral. On August 5 there was an action against a division of cruisers under Captain Thomas, representing an enemy. Admiral Gervais divided his fleet into two squadrons, the first comprising the Bouvet, the Atlantic battleships, and those of the Reserve Division, 11 in all, in an indented formation, columns of division line ahead. The Mediterranean Squadron followed in the same formation, and there were two divisions of armoured cruisers and the torpedo boats of the mobile defence of Toulon. At the end of the action the enemy's line was completely enveloped, having squadrons on the port and starboard sides, and divisions of armoured cruisers ahead and astern. The engagement was in the nature of a tactical exercise, for such a disproportion of strength would not be found in any actual hostilities. The squadrons thereafter proceeded to Toulon, where there was an exercise in coaling, victualling and watering the fleet, the manœuvres thus being brought to a close.

It will be observed that night operations were a prominent feature, and much credit must be given to officers and men who displayed great zeal in all the enterprises. Undoubtedly such operations will always play a large part in naval warfare, and the French showed considerable ability in the courage with which they grappled with the difficulties. There was a defect in the handling of some of the cruisers, which exposed themselves to the surprise of an attack by superior forces, but these were not allowed to affect the course of operations. Wireless telegraphy exercised an important and decisive influence, enabling touch to be kept at distances that would have been impossible without its aid. The torpedo boats played an insignificant part, and it was the universal opinion that much is required to give them cohesion and effective power in their duties. From the strategical point of view two successes are claimed—the first being the power of observing the Straits of Gibraltar by the cruisers of a force stationed at Mers-el-Kébir, and the second the observing control of the passage to the south of Sardinia by a squadron stationed at Ajaccio. In regard to tactical matters, it would appear that the line ahead was much under trial, with the employment of distinct groups of forces, according to speed and strength, leading to many interesting combinations, but upon these matters little can be said. It may be added that the submarines Gustave Zédé and Gymnote proceeded from Toulon to the Salins, and ran the blockade to join the *A* squadron. Both appear to have been in action, and are stated to have succeeded in torpedoing the Brennus, Jauréguiberry and Charner. Considerable doubt attends this matter.

Conclusions.

Much attention was directed later on to the manœuvres of the submarine flotilla at Cherbourg, which concluded on October 16, there having been four series of operations in which the vessels of the Northern Squadron were attacked at anchor on some occasions, while on others the boats attempted to bar the passages to anchorages against them. The submarine service had been reorganised, and Admiral Fournier, who was its chief, had devoted great attention to the exercises throughout the year. It is unnecessary to describe the precise character of the attacks at Cherbourg and Saint Vaast la Hougue. More useful is it to deduce some of the lessons from the report of Commander Heilmann, commanding the station at Cherbourg, which appears to have been communicated to the Press without the knowledge of the Ministry of Marine, though of its accuracy there can be no doubt. The conclusion is that only submersible boats are capable of keeping the sea, and that submarines of the Morse type must be regarded merely as accessories,

Submarine operations at Cherbourg.

"whose crews would end by becoming the victims of disquieting moral depression." Commander Heilmann observed that to seamen sea-going boats were necessary. No one could have done better than the French officers engaged in the service. They had shown their qualities during the operations, but the outcome was the triumph of the submersible. "It can only be with boats of this class that an attack upon a squadron steaming at 12 knots will be possible, as has been proved, and to make the submersible really effective improvements must be introduced, its speed must be increased, and the conditions of life in it must be improved."

An attack made upon the Valmy at Saint Vaast, on October 8, was the most successful of the operations, and was held to prove that the submarine boats could leave their station secretly, and that a squadron would never be safe in an anchorage within their range of action. A battleship or a naval force would obviously commit a grave fault in anchoring in an open roadstead such as that of Saint Vaast, for there can be safety only in a protected harbour if submarine boats are in the neighbourhood. The officers in the ships were unanimous in testifying that no submarine boat was detected either on the departure from Cherbourg or the arrival at Saint Vaast. The officers in the submarines tried the ruse of sending empty bottles afloat sunk to the neck, which several times drew the fire of the ships, being mistaken for the periscopes of submarine boats.

Lessons drawn.

The chief points to be noted, as deduced from the reports of the officers engaged, were that open roadsteads are unsafe anchorages, that careful watch kept on board ships is of comparatively little value if submersibles are well handled in attack, that the supervision of an open anchorage by destroyers or torpedo boats gives no real security, that submersible boats are alone useful in operations in the open sea, and that attacks on ships under way are extremely difficult.

Amongst the devices which have been presented to Admiral Fournier is one for enabling communication to be established by wireless telegraphy between submarine or submersible boats and ships or shore stations. It is the invention of Lieutenant Tadié of the Algérien. A mast with a receiver was fixed on the Triton, and this submersible, having made a plunge, received from the central post of the Cherbourg station a communication with perfect clearness. If this system should prove its real value, it should add something to the efficacy of submarine boats, which would no longer be isolated, but could operate to some extent under direction from ships or the shore.

GERMANY.

The German manœuvres of 1902 served to mark the considerable progress which had been made in the expansion of the German fleet since the manœuvres of 1901. In that year three battleships of the "Kaiser" class and four of the Brandenburg class were employed in the operations, but the completion of new vessels enabled the number of the former to be increased to five in 1902, while one of the latter was in hand for reconstruction. The Director of the manœuvres was Admiral von Koester, Commander-in-Chief at Kiel, who had his flag temporarily in the Grille, afterwards removing to the Kaiser Wilhelm II. Captain Breusing was chief of his staff, and Vice-Admiral Büchsel, Chief of the Admiralty General Staff in Berlin, was on board his flagship, though not acting in an official capacity. The forces engaged were the First and Second Squadrons, with cruiser divisions and torpedo flotillas attached, and in the various schemes the forces acted in opposition to represent national and foreign squadrons. The constitution of the fleet was as follows:— Forces engaged.

FIRST SQUADRON.—Admiral Prince Henry of Prussia.

First Division: Kaiser Friedrich III. (flag), Kaiser Wilhelm der Grosse, Kaiser Karl der Grosse.

Second Division: Kurfürst Friedrich Wilhelm (flag of Rear-Admiral von Prittwitz und Gaffron), Brandenburg, Weissenburg, Kaiser Barbarossa.

Cruiser Division: Prinz Heinrich, Victoria Luise, Freya (joined on September 1), Amazone, Niobe, Hela.

Torpedo Flotilla: Corvette—Captain Scheer, with his pennant in Destroyer S. 106. First Division: Destroyers S 102, 103, 104, 105, 107. Second Division: S 96, 98, 99, 100, 101.

SECOND SQUADRON.—Rear-Admiral Fritze,

First Division: Baden (flag), Württemberg, Beowulf.

Second Division: Hildebrand (flag of Rear-Admiral Galster), Heimdall, Hagen.

Torpedo Flotilla: Corvette—Captain Wilbrandt, with his pennant in Destroyer S 94. First Division: Destroyers S 91, 92, 93, 95. Second Division: Destroyer D3, first-class torpedo boats, Nos. 68, 69, 70, 71, 72, 73.

It may be observed that, as in previous years, the manœuvres, though including certain strategical movements were mostly in the nature of evolutionary exercises. They covered the period from August 17, when Admiral von Koester hoisted his flag in the Grille at Kiel, until September 18, when an attack was made on the defences of the Elbe. The particulars that follow are taken mainly from the letters of a correspondent of the *Hamburger Nachrichten*, who was on board the Kaiser Wilhelm II., with some notes from the *Neue Preussische Kreuz-Zietung* and *Ueberall*.

The operations began at 8 p.m. on August 17, when Prince Henry gave orders to raise steam for full speed, and the cruisers and torpedo flotilla of the First Squadron left Kiel at midnight, the battleships following at 9 a.m. on the 18th. The Second Squadron The first tactical operations.

had assembled at Danzig, and represented an enemy endeavouring to pass to the eastward and join a stronger allied force understood to be coming through one of the passages from the Cattegat. The latter was imaginary, but may be taken to have represented a division of French ships endeavouring to effect a junction with their Russian allies. The object of Prince Henry of Prussia was to defeat the purposes of Rear-Admiral Fritze, and, if possible, to bring him to action, and crush him with overwhelming force before he could unite his forces with the squadron from the North Sea. With that intention he extended his cruisers upon a wide front, endeavouring to observe the whole extent of the Baltic in that section in which the hostile squadron was expected to be encountered. At its narrowest point the Baltic is about 90 miles across, and is divided into two passages by the Danish island of Bornholm, and the difficulty was complicated by the fact that Admiral Fritze's movement in the zone under observation would be made in the night.

Failure of the cruisers.

The ships were cleared for action, the men kept at the guns, and all lights extinguished, but when day broke on the 19th it was discovered that the enemy had slipped by in the darkness, having passed between Bornholm and the Swedish mainland at Sandhammar. The success which attended Admiral Fritze appears to have been due in part to an imperfect system of communication, and perhaps of organisation in the Cruiser Division, and the failure to intercept his force is only another illustration of the fact that a larger proportion of cruisers to battleships is required than has sometimes been considered necessary.

Various exercises.

The combined fleet then proceeded to Danzig, Admiral von Koester transferring his flag to the Kaiser Wilhelm, and in the following days there were squadron exercises, steam tactics, and, on the evening of the 23rd, a torpedo attack. It was supposed that an enemy, represented by the First Squadron, had bombarded and destroyed the port at Danzig, and had been detained in the gulf owing to some necessary machinery repairs. A German fleet was known to be coming to the relief of the place in much superior force, and it was therefore necessary for the assailant to reach the open sea as soon as possible. Prince Henry weighed at nightfall with ships cleared for action and all lights extinguished, but his adversary had cruisers and a torpedo flotilla lying in the neighbourhood of Pillau, and the issuing squadron was discovered and kept under observation. A dashing torpedo attack was then made, the boats being boldly and skilfully handled, but they were brought under the searchlights, and a heavy fire was poured upon them. What would have been the result in actual hostilities it is, of course, impossible

to say, and the operation was really an exercise for the training of officers and men in actions of the kind. Other operations of a like nature followed, the ships proceeding to sea and anchoring again in the evening, with various torpedo attacks. One of these was made when the fleet lay in single line at Edingen, on the evening of August 26, torpedoes with collapsible heads being used for the first time. The night was very dark, but the boats were boldly handled, and the Kaiser Wilhelm II. was fairly hit amidships, while some other ships were also touched. All the torpedoes were recovered.

The concluding scheme.

The ships then filled their bunkers, and the fleet left Danzig on August 31 for the concluding operations. The plan laid down was based upon the idea that the Germans had suffered a defeat in the North Sea, and were hard pressed in the Baltic. One German division, that of Rear-Admiral Galster, with a torpedo flotilla had been separated from the main body, and was known to have come round the Skaw and to be endeavouring to reach the Baltic from the Cattegat. The enemy in the Baltic, represented by the First Squadron and the first division of the Second Squadron, was endeavouring to discover Admiral Galster's German division, and to bring it to action. Prince Henry, therefore, decided to divide his fleet into three squadrons, each of them more powerful than the German force. Through the Little Belt, Admiral von Prittwitz was to take the Kurfürst Friedrich Wilhelm, Brandenburg, and Weissenburg, with the cruisers Amazone, Nymphe, and Hela. Prince Henry of Prussia was to pass through the Great Belt, with the Kaiser Friedrich III., Kaiser Wilhelm der Grosse, Kaiser Karl der Grosse, the cruisers Prinz Heinrich, Victoria Luise, and Freya, and a torpedo division. Through the Sound were to pass the Baden, Württemberg, Beowulf, and the cruiser Niobe, with a torpedo division, under command of Rear-Admiral Fritze. The weather was foggy, and the exercise was certainly valuable as a training in seamanship in the dangerous navigation of those passages, and had the merit of approaching rather nearly to such an operation as might actually take place in war. It may be observed incidentally that the German battleships are built with special regard to the necessity of navigating shallow waters, and that not all foreign battleships could take advantage of passages that are open to them.

Success in evasion of Admiral Galster.

Rear-Admiral Galster chose for his attempt the passage of the Little Belt, and sent his torpedo boats ahead to reconnoitre the narrow waters. Prince Henry's forces, meanwhile, were making a thorough examination of each of the channels, and the problem was rendered more difficult by the many strong currents, numerous shoals, and foggy weather. Every bay, inlet, and passage was

searched, this important task being undertaken by the large force of cruisers and torpedo boats which preceded the squadrons, without however finding any trace of his adversary. As a matter of fact, Rear-Admiral Galster had left his anchorage off Hesseloe Island at 2 o'clock on the morning of September 2, while Prince Henry's vessels were passing northward through the channels, but as soon as his torpedo boats came into touch with the scouting vessels of Rear-Admiral von Prittwitz coming up through the Little Belt, he practised a ruse. Being in inferior force it was impossible for him to attempt the passage, and he retreated. Pursuit was not immediately possible because Prince Henry had not yet passed through the Great Belt, and the difficulty was complicated by the dense fog. That evening, however, the three squadrons of the enemy united, and entered upon a pursuit of the weak German Squadron through the Cattegat. The advantage, however, now remained with Rear-Admiral Galster, who, although he had no cruisers, succeeded in slipping by his adversaries, and got so far south that there was no possibility of overtaking him.

The great and justified object of Prince Henry of Prussia had been to destroy his adversary in action, but it may be questioned whether it was wise to leave the narrow passages and to take the chance of finding him in the more open waters beyond. Inasmuch as each squadron was sufficiently strong to bar the passage of the channel which it was appointed to guard, it would have seemed a safer procedure to await the coming of the hostile Admiral, and to have engaged him in narrow waters if he attempted to force a passage.

After this exercise the fleet anchored off Läsö Island, but the manœuvres were resumed on the morning of September 4, when it was supposed that the German Squadron had been driven back, but had received reinforcements in the Skager Rack, the Baden, Württemberg, Beowulf, the armoured cruiser Prinz Heinrich, and a second torpedo division being now added to Admiral Galster's division. With this force he was to reach Heligoland in safety, and the hostile squadron, which had much superior speed, was to endeavour to bring him to action. The cruiser Prinz Heinrich had a vigorous engagement with the Freya and Victoria Luise, in which she was successful, although the umpires considerably reduced her speed as the result of supposed damage to her engines. Incidentally it may be remarked that this system of direct umpiring presents many advantages, and enables the conditions to approach somewhat more nearly to those of war. There was also a torpedo attack, boldly led, but apparently without success, and at daybreak, although the enemy was rapidly coming up astern, Rear-Admiral Galster was able to reach his anchorage in safety.

After some further exercises, the last important operations began on September 14, when the fleet put to sea, the Kaiser being present. The idea was that Germany had suffered severe defeat in the North Sea, and that it was necessary, with the few remaining ships, to make a final stand, and defend the mouth of the Elbe, Hamburg, and the Kaiser Wilhelm Canal. The defending force included only the Brandenburg, Württemberg, Baden, and Beowulf, with the Freya and Hela, and the torpedo boat divisions, while with the assailant were the whole of the other ships available. Measures were taken by the assailant to establish a blockade of the Jhade, Weser and Elbe, and to check any action on the part of the defending vessels, which had sought refuge in the latter. A complete control of the sea was established, and Borkum Island was seized, enabling the cables to be cut, Germany thus being supposed to be deprived of all communication with other countries. There were night operations, and one of the blockading cruisers was put out of action, and another regarded as seriously damaged by the defending torpedo boats. On the 17th an attack upon the Elbe was contemplated, but the weather was so boisterous, and the sea so rough, that the Emperor, who arrived in the Hohenzollern, directed the operations to be postponed until the next day, his order being transmitted to all the vessels by means of wireless telegraphy. The final struggle took place on September 18, when the attacking fleet stood in towards the mouth of the river, and, after heavily bombarding the forts, forced the passage, the ships going by the fortifications at full speed still firing. The German squadron made a vigorous defence, and two of the attacking ships were put out of action, but so great was the superiority of the assailant that victory was accorded to him. The operations came to a close in very bad weather. The attack upon the Elbe.

This considerable series of operations does not call for much comment. Only those who are actually engaged can know the full value of the many exercises undertaken. There was strategical significance in the attempt to bar the passage of a squadron passing westward through the Baltic, and the failure doubtless enforced what is admitted to be a great need of the German fleet—the possession of a sufficient body of cruisers. It is stated that wireless telegraphy upon the Slaby-Arco system was tested, but, if it was used, it did not contribute to success. There was strategic significance also in the operations in the Belts and the Cattegat. The final attack upon the mouth of the Elbe was no more than a mere exercise in the handling of ships and their guns, and was a spectacular operation such as is usually contrived at the close of the German manœuvres. As a training for officers and men there can be no doubt that the The lessons.

operations were highly valuable. The officers of the torpedo boats acted with zeal and boldness, but it is impossible to say what measure of success attended their attacks. When used for scouting purposes the boats proved of little or no value.

UNITED STATES.

The plan. Resisting an enemy from Europe. Forces engaged.

The United States Navy was engaged in three sets of manœuvres during 1902. There were two strategical exercises—in August and December—and there were combined operations with the military forces. In the August manœuvres Admiral Higginson commanded a considerable fleet, which represented the United States Navy acting upon the defence, while Commander Pillsbury led a small force, representing an enemy from Europe, in the attack. Numerical values were attached to the ships, and the composition of the forces was as follows:—

BLUE SQUADRON.—Rear-Admiral Francis J. Higginson.

Alabama, 20; Kearsarge, 20; Massachusetts, 20; Brooklyn, 8; Olympia, 8; Cincinnati, 3; Gloucester, 3; Mayflower, 3; Montgomery, 3; Scorpion, 3; Hist, Leyden, Nina, Peoria, and seven torpedo boats, 1 each. Total value, 102.

WHITE SQUADRON.—Commander John E. Pillsbury.

Panther, 20; Prairie, 20; Supply, 5. Total, 45.

The instructions to the White commander were that at noon on August 20 he was to be at some point in the North Atlantic lying at less than 480 miles from a position indicated in latitude 40 N. and longitude 50 W. From this place he was to proceed to any undefended anchorage between Portland and Cape Cod, and anchor there before noon on August 25. Portland was open to him, but not Casco Bay. His division represented an advanced detachment of an enemy's squadron attempting to seize an anchorage upon the coast as a base for its operations. The place selected was to be capable of accommodating several large ships, with not less than six fathoms of water, and be capable of gun and mine defence, and be in other respects suitable for such a base, and it was to have a deep water approach from the sea. Upon his arrival on the coast Commander Pillsbury was immediately to commence mining and fortifying, and unless he should be interrupted by Blue in superior force within six hours he was to be considered as having succeeded. Rear-Admiral Higginson, in command of the Blue defending force, was to receive intelligence on August 20 that an enemy was known to have left Fayal on August 14, having three heavy ships, with supply vessels and colliers, these last not being actually represented, and to have been sighted in a given latitude and longitude on August 18, steering

west. The Blue commander was to endeavour to prevent any base being seized upon the United States coast between the places indicated. Both squadrons were absolutely unrestricted in regard to speed and movement.

At the appointed time the operations began. After running nearly forty miles south from the position he had taken up, Commander Pillsbury headed west towards the American coast. After steaming for nearly one hundred miles he altered course to the south-west, and then being a little below the latitude of New York, went to the north again. At night he navigated with lights out or screened.

Coast signalling arrangements.

Admiral Higginson had divided his line of coast into five districts, each in charge of an officer provided with scouting vessels, and a number of observers at shore stations. These districts all reported by telephone, telegraph, or other means, to a central station at Rockport, from which place intelligence was transmitted to the Admiral by means of steam boats or signals. Admiral Higginson proceeded with his battleships to a position near Thatcher's Island, where he would be within easy reach of both ends of the line, and there he remained at anchor until the morning of the 24th.

Successful cruise and accidental failure of the enemy

Commander Pillsbury had designed to enter Salem Harbour, but arriving off the coast on the 24th, when it was still too dark for his purpose, he turned south-westward and headed towards Boston. In so doing he approached Thatcher's Island, as ill fortune had it, and, being discovered by the Blue squadron, was placed in a hopeless situation. He steamed at full speed towards his intended anchorage, however, but the defending squadron arrived on the scene long before the stipulated period had expired. The success of Admiral Higginson was therefore complete, although it was almost accidental. Commander Pillsbury's force was deficient in speed, and had no means of scouting, but it had been successful in evading the look-out ships of the defenders, and had arrived upon the coast undetected. Admiral Higginson, in his report, urged upon the Navy Department the installation of wireless telegraphy in all the ships of the Navy.

Continued naval and military operations

At the close of these operations the squadron proceeded to Menemsha Bight, in order to undertake combined manœuvres with the army, in relation to which it may be enough to say that they included an attack upon Plum Island, from the northern side; a day attack upon the batteries at Fisher's Island; a night run through the Race; a night attack upon Fort Rodman; a day attack on Newport, and a running of the batteries there at night; the capture of three signal stations by landing parties; a cable-cutting expedition, which severed connection between Martha's Vineyard and the mainland,

and the clearing of the Newport Channel of torpedoes and countermining the passage. It was observed that in approaching the positions at night the searchlights would flash very often upon the ships, lighting up the smoke stacks and hull so that print could easily be read on board, and yet that the observers were often unable to see the vessels upon which the lights fell. Admiral Higginson drew attention to this fact in his report, and added the significant remark that if all other aids to navigation had been extinguished, the fleet had in the searchlights of its adversary a sufficient guide for an approach to his position.

The winter manœuvres. The enemy from Europe.

The Caribbean manœuvres in the winter were directed to the solution of the same problem involved in the August operations. Admiral Dewey was in chief command, and the opposing forces were under Rear-Admiral Higginson, again commanding the White squadron, and Rear-Admirals Sumner and Crowninshield commanding the Blue squadron. The White squadron represented an advanced detachment of an enemy attempting to secure a base in Porto Rican waters, between (and including) Mayaguez on the west, and Great Harbour, Culebra, on the east. This was to be seized and mined, as in the earlier manœuvres; and in order to defeat this enemy the Blue force must engage it at sea, or within one hour after it had anchored in the port selected. Blue might still be victorious if he arrived later and proved to be fifty per cent. stronger.

The enemy seizes a base in Porto Rico.

Admiral Sumner, with the White squadron, left Trinidad on December 4 to proceed to a point within a circle having a radius of 720 miles, the centre of which was in latitude 15 N. and longitude 45 W. His plan was to make feints in certain directions, and to veil the movements of his main force. He, therefore, sent the San Francisco, Atlanta, Nashville, and Eagle through the Windward Passage between St. Lucia and St. Vincent, with orders to proceed towards the southern coast of Porto Rico, where a feint was to be made towards the south of Ponce. Meanwhile, with his main force, the battleships Iowa and Illinois, and the cruisers Chicago and Albany, he left the curve of position at full speed, making a detour to the east and north of the Windward Islands and Porto Rico, and keeping some 200 miles from the coast so that he might not be observed by the Blue scouts. He navigated at night without lights, but at a speed of not much more than 13 knots, and, having eluded all the defending vessels, steamed through the Mona Passage, between Porto Rico and Dominica, and entered the harbour of Mayaguez at dawn on December 8. The Hist, of the Blue fleet, which was in the harbour at the time, fled to carry intelligence. Shortly afterwards the White cruisers joined the main

body. It was not until 9 a.m. on December 9 that Rear-Admiral Higginson, commanding the Blue fleet, arrived off Mayaguez, 14 hours after the harbour had been mined. He had been completely out-manœuvred, the attacking Admiral being triumphantly successful, after making a long steaming without lights at night, with many exact courses, covering a route of more than 1500 miles in 5 days, and running his large and heavy ships into a harbour just at dawn. It deserves to be noted that the defending Admiral was not conspicuously deficient in cruisers. His battleships were the Kearsarge, Alabama, Massachusetts, Indiana, and Texas; his cruising vessels the Olympia, Cincinnati, Newark, Montgomery, Machias, Marietta, Detroit, Bancroft, Scorpion, and about a dozen smaller scouting and other vessels available for the purpose, besides a torpedo flotilla. Perhaps the only lesson to be drawn from the operations is the need of a very large force of cruisers for the attainment of success, and of a wise organization of all forces so employed.

AUSTRIA-HUNGARY.

The plan—to land troops to capture Pola.

The operations of the Austro-Hungarian fleet in the neighbourhood of Pola, including the landing of men for the capture of that place, were more important than any manœuvres undertaken by the forces of the Dual Monarchy for many years back, but they may be described somewhat briefly. The underlying idea was that the principal naval forces of Austria-Hungary were blockaded in a port of Southern Dalmatia, and that thus an enemy had command of the Northern Adriatic, his purpose being to land forces for the capture of the great naval arsenal of Pola. It may be remembered that this important Austrian port lies on the south-western side of the Istrian Peninsula, and some 12 miles from its southern extremity. It is powerfully defended by fortifications on the sea front, the southern fort being Veruda, from which point there is a girdle of land defences from Monte Turcian on the east to Monte St. Daniele on the north-east, this defensive line being from 6500 to 10,000 yards from the east coast of Istria. The water approach on that side is through the Quarnero, and it might be possible for ships to throw shells from their heavy guns into the fortifications if they ventured so far.

The naval operations were directed by Admiral Baron von Spaun, chief of the Naval Department, and the military forces engaged were under the command of Lieutenant-General Baron von Beck, chief of the army general staff. Pola had but a small garrison, and it was impossible to supply further reinforcements. There was a floating

defence under Commodore Leopold Ritter von Jedina, in the Kaiser Franz Josef, which consisted of a torpedo flotilla. The attacking squadron, under the command of Rear-Admiral Julius von Ripper, was composed of the Monarch (flag), Wien and Budapest, with a cruiser division consisting of the Tiger, Panther and Leopard, under the command of Commodore Julius Ritter von Beck. The troops intended to be disembarked comprised eight battalions, a light battery, and a squadron of dragoons, being in all 4500 men, with 110 horses and four guns, and they were embarked at Trieste in the Habsburg, Bukovina, Electra, and Galizia of the Austrian Lloyd, which had been chartered as transports. The embarkation occupied three hours, and was accomplished without any hitch. The Emperor was present during the operations that followed, in the Imperial yacht Miramar, the Archduke Rainier being with him.

Preparations.

As is usual in manœuvres, there were preliminary exercises, including a torpedo attack and target practice, which is said to have given good results, and war was declared at 10.30 a.m. on September 2. The defending torpedo flotilla remained in readiness at Veruda, and the torpedo cruiser Satellit cruised in the Quarnaro between Sansego and Asinello, while Commodore von Jedina, in the Franz Josef, was on the Istrian coast. The assailants, considering it impossible to make an attack upon the sea front of Pola, decided to attempt to land the troops to the south-east of the place. Rear-Admiral von Ripper seized the island of Lussinpiccolo as his advanced base of operations, sending his cruiser division and two destroyers with the Magnet to blockade the harbour of Pola while he prepared the defences of Lussin. He placed the Monarch to control the Bocca Falsa, and mines were laid down, wire defences prepared, and the light guns landed from the ships and placed in protected batteries. A boom was also laid down, and a station was established on the top of Monte Ossero in communication with the harbour and battery by telephone.

Torpedo attack on the fleet and transports.

Having thus made his preparations, the Rear-Admiral left his anchorage at 11 p.m. on September 2, but the defending torpedo boats were on the watch under the island of Unic, and when the squadron was passing the north side of Sansego they delivered an unexpected attack. It may be questioned whether in actual hostilities the Rear-Admiral would have entered upon such a perilous enterprise as that of proceeding with transports through waters affording many facilities to torpedo boats. It was thought by many that the attack would have been disastrous for the force engaged. If there had been more time Rear-Admiral von Ripper would, one supposes, have endeavoured to seek out and destroy the boats before he ventured to

sea with 4500 men in transports. As it was, after the attack, he proceeded to Medolino Gulf, and at 4.30 on the morning of September 3 arrived off Porto Cuja, and preparations to disembark the troops began immediately. The cruiser division, which had been blockading Pola, rejoined, and Commodore von Jedina made another attack with his torpedo flotilla, which was not allowed to affect the result. The troops were landed, parties of seamen having first gone ashore to seize suitable positions, and the defenders were driven under cover of their forts. At this point the Emperor checked the operations, and the manœuvres came to a close.

Lesson. Over-sea operations

The lesson to be drawn from these manœuvres is, of course, that if a coast is to be protected the neighbouring seas must be controlled. It has long been a truism with Austrian officers that the national navy is insufficient for national safety, but it remains to be seen whether ships will be more rapidly multiplied than is at present in contemplation. The only point which seems to call for comment is that already alluded to—that the Rear-Admiral commanding the attacking force, impelled, perhaps, by the limited space of time available, attempted to conduct over-sea military operations without having first secured effective control with his fleet. The attack delivered by Commodore von Jedina's flotilla seems to have reflected the greatest credit upon the officers engaged. The experience in embarking and disembarking the troops was no doubt of considerable value.

General conclusion from the foreign manœuvres—the greater demand for cruisers.

If a broad general lesson may be drawn from the naval manœuvres of the Foreign Powers in 1902 it is that greater efficiency than ever is necessary in the cruiser service. Hardly any squadron engaged possessed a sufficiency of vessels of the class to keep it well informed of the movements of its adversary, and when touch was gained there was sometimes failure in organisation, which made it impossible for it to be maintained. In the French manœuvres the bold action of Rear-Admiral Boutet enabled him to hang on to the heels of his adversary, although, as has been suggested, he might have paid dearly for his temerity in actual war, and in the end he was unable to accomplish his purpose. In the second series of strategical manœuvres the cruisers did, indeed, render admirable service, and their organisation and use of wireless telegraphy were a lesson in the results of that efficiency which results from organisation and training. In the German manœuvres the cruisers failed to give a good account of themselves, being

completely out-manœuvred by Admiral Fritze, and in the latter operations their success was not conspicuous. Indeed, neither in numbers nor in training were they able to render the service that was expected of them. The same may be said of the United States naval manœuvres. In both the principal series of operations the failure was indeed complete, inasmuch as the cruising divisions never got into touch at all with the adversary. In the Austrian manœuvres no great demand was made upon the cruisers, but it is easy to see that in greater numbers they would have added much to efficiency on either side. Thus, perhaps, looking broadly at the foreign manœuvres of last year, the great lesson to be drawn is the necessity of far larger consideration being given to the provision of cruisers, and to efficient training in all the varied duties of their important service. It is certainly deserving of note that the General Board of the United States Navy, reporting since the manœuvres to the naval secretary upon the subject of a shipbuilding programme, has recommended that for every four battleships put in hand, two armoured cruisers, four cruising scouts, and four sea-going destroyers, as well as certain auxiliaries, shall be begun.

JOHN LEYLAND.

CHAPTER VIII.

THE MEDITERRANEAN MANŒUVRES OF 1902.

There were no naval manœuvres in home waters in 1902; but after the Coronation Review the Channel and Home Fleets were combined for a series of tactical exercises, concerning which no authentic information has been published in this country. It is worthy of note, however, that a more or less detailed appreciation of the operations, purporting to be authentic, has appeared in a German service periodical. There is probably nothing in this article which the Admiralty would have desired to keep secret; but it does not follow that foreign Powers have not obtained from similar clandestine sources all the information they desire. Be this as it may, the fact remains that English readers who take an intelligent interest in naval affairs, and desire to know what is going on in their own Navy, have to go to a German periodical for their information. The policy of the Admiralty in the matter is open to criticism on many grounds. It very seldom succeeds. It too often sacrifices the substance to the shadow. It makes no distinction between information which it is, or may be, really important to keep secret and information which might safely be disclosed with great advantage to the service and the country. It opens a door to all sorts of clandestine and possibly unscrupulous proceedings, and, above all, it keeps the Navy at large in the dark about what this or that portion of it may be doing. Secrecy and publicity.

The same futile policy was originally pursued in regard to the combined operations of the Mediterranean, Channel, and Cruiser Squadrons which took place in the Mediterranean in the early autumn. These operations were, as we now know, very much of the nature of the manœuvres which have taken place in home waters for many years past. But no representatives of the Press were allowed to be present, and even guests were excluded from the ships engaged. Nevertheless some accounts of the operations found their way into one or two English newspapers. These accounts were certainly unauthorised, and very likely they were inaccurate and misleading as must almost necessarily be the case where the Futility of the policy of secrecy.

informants are irresponsible and very eager to escape identification. From the nature of the case such informants must be persons under the jurisdiction of the Admiralty. But it does not appear that anyone has yet been punished for disclosing information which was declared to be matter of official secrecy; and it certainly seems absurd that the Admiralty should keep the whole Press of the country at arm's length when they cannot even keep in order offenders of their own household. Identification is difficult, it may be said, and practically impossible. Be it so. The argument is fatal to the whole policy. If the exclusion of those who can be kept in order is found to be no guarantee for the silence of those who cannot be kept in order, there is nothing to be said for it at all.

The policy now happily abandoned.

It is only right to acknowledge, however, that a more liberal and enlightened policy now appears to be in favour at the Admiralty. A Parliamentary paper has lately been issued, entitled "Narrative of the Combined Manœuvres by the Mediterranean, Channel, and Cruiser Squadrons, 1902." It is a most interesting document, authentic, dispassionate, and full of instruction; and though discreetly reticent and severely impartial it nevertheless contains much food for profitable, but by no means jubilant, reflection. It is in fact the record of a great failure—a failure which, if inevitable, that is, inherent in the conditions of the problem propounded for solution, must compel us to revise many hitherto accepted canons of naval warfare; while if it was not inevitable in that sense it must suggest some painful reflections as to the personal qualities of those who were responsible for it.

Object of the manœuvres in the Mediterranean.

The "special object of the manœuvres" was defined as follows:—

The special object in view in drawing up the scheme of the 1902 combined manœuvres was to endeavour to ascertain what risks are involved in keeping such a close watch on a fleet in a defended port as to ensure bringing it to action if it issues therefrom. This object was selected because it is the consideration of these risks, taken in conjunction with the amount of mischief the enemy's fleet is capable of doing while at large, and the relative strength of the two fleets, that must determine the question whether it is better to try to bring an enemy to action in the immediate neighbourhood of his port, or adopt some other line of strategy involving less risk to our own ships, but giving him greater chances of evasion.

This definition is important and instructive. It seems to take for granted that a sufficient force properly handled can "keep such a close watch on a fleet in a defended port as to ensure bringing it to action if it issues therefrom." The problem propounded was not to ascertain whether or not this can be done; but, assuming that it can be done, to ascertain what risks are involved in doing it. Either this is an unsound and therefore dangerous assumption or, if it is a sound one, it compels a search in very delicate regions for the explanation of a result which

seems to disallow it. The following were the "arrangements made for carrying out the general idea":—

As it was not possible to devise any scheme of manœuvres that would test more than one method at a time, it was arranged to limit the operations in this instance to a blockade. For that purpose the ships taking part were divided into three fleets, designated A, B, and X respectively, of which A and B represented the blockading force, and X the blockaded. A and B were each inferior in fighting power to X, but superior in combination, and faster. The Mediterranean Commander-in-Chief, Sir Compton Domvile, was in command of the whole blockading forces, with A fleet under his personal orders, while B was under the orders of Vice-Admiral Sir Arthur Wilson. The X fleet was by first arrangements to have been under the command of the late Rear-Admiral Watson, but, unfortunately, just before the manœuvres that officer contracted the illness which caused his death, and Captain H.S.H. Prince Louis of Battenberg, the senior captain of the Mediterranean fleet, was directed to hoist his broad pennant on board the *Implacable*, as Commodore of the second class, to succeed him. In all, 19 first-class battleships, 2 armoured cruisers, 20 protected cruisers, 21 torpedo boat destroyers, and 6 torpedo boats took part.

With the consent of His Majesty the King of the Hellenes, the harbour of Argostoli in Cephalonia was selected as the port in which X fleet was to be blockaded, being supposed to represent a first-class fortress, and the object of that fleet was to break out of this shelter and join reinforcements supposed to be either to the eastward of the Island of Kos, or westward of the meridian of Palmas Bay in Sardinia, without being brought to action by either an equal or superior force, or if possible followed, while doing as much damage as they could effect to A and B before breaking out. The object of A and B was to prevent the accomplishment of these designs. The duration of hostilities was limited to ten days, and the following rules were drawn up for guidance:—

Rule 1.—(*a*) The coast line of X territory is as follows: It commences at longitude 16° E. near Cape Spartivento, follows the coast of Italy to the parallel of 39° N., near Cape Colonne, thence to Cape Aterra (Cephalonia), following the coast of Cephalonia to the southward, round the Port of Argostoli to Cape Scala, from there to Cape Katakolo, then following the coast line of Morea as far as longitude 22° 10′ E.

All islands off the above coast line of Morea belong to X. Kos and Palmas belong to A and B. Strovathi Island is neutral, and is not to be used by either side. All else, including Sicily, is neutral.

(*b*) An imaginary coast line is to be drawn, starting from latitude 38° N., longitude 8° E., to latitude 38° N., longitude 9° E., thence to Cape Bon, from there to latitude 36° N., longitude 12° E., thence to Cape San Dimitri. Follow the coast of Gozo to the S.E., across the N.E. end of the Comino Channel, and down the north side of Malta to Cape Delimara, thence to latitude 34° N., longitude 15° E., following the parallel of 34 N. to longitude 23° 30′ E., thence to the S.W. point of Crete. Follow the coast line of Crete to Cape Sidero, thence to latitude 34 N., longitude 26° 25′ E., thence to latitude 34 N., longitude 27° 30′ E. Any vessel crossing to the southward of this line or to the northward of the 40° parallel of North latitude is out of action.

(*c*) Argostoli, Navarin, and the south bay of Zante, from a line drawn from Cape Marathia to Cape Ieraki, are to be considered as first-class fortresses belonging to X. Kos and Palmas are to be considered as first-class fortresses belonging to A and B. Ships approaching within a radius of 8000 yards of the entrance to any of these ports are liable to be ruled out of action by the umpires. The entrance to the port of Argostoli is to be considered between St. Georgias and St. Nicolaos Points.

Rule 2.—When war is declared all ships are free to leave their ports, except the battleships of X fleet, which cannot leave Argostoli for 24 hours.

Rule 3.—The object of X fleet is to break out and join reinforcements, supposed to be either to the eastward of Kos or to the westward of Palmas, without being brought to action by either an equal or superior force, and, if possible, without being followed, and also to do as much damage as they can to A and B fleets before breaking out.

Rule 4.—The operations must be considered as an experiment to obtain correct data as to the chances of evasion on the one side and of the risks on the other, and not as a question of defeat or victory for either side.

Rule 5.—The manœuvres will cease when X fleet reaches the meridian of either Kos or Palmas, or when it has been brought to action by an equal or superior force.

Rule 6.—After the operations have commenced ships can coal only at their proper ports of Argostoli, Palmas, and Kos, or at sea at a distance of more than three miles from any neutral territory.

Rule 7.—No use is to be made of neutral ports except as follows:—

(*a*) They may be used for sending and receiving information by telegraph.
(*b*) Colliers may be stationed at them to await orders.
(*c*) Vessels of war may anchor in them, but in this case their arrival must be telegraphed to the headquarters of the enemy.

Rule 8.—If vessels belonging to opposite sides are in the same neutral port, and a vessel of one side leaves, those on the other side cannot leave for 24 hours after.

Rule 9.—If any vessel belonging to A or B fleets has to go to Malta she will be put out of action altogether, unless she has enough coal on board to take her to Palmas. If she has this amount of coal on board on arrival she may complete with coal less the amount required to steam from Palmas to Malta. She may also carry out any necessary repairs, but after all work is completed she must remain for 60 hours to represent the time that would be required to steam to Palmas and back.

Rule 10.—Ships out of action, or awaiting the decision of the umpires, on both sides are to proceed to Kalamata, Suda Bay, or Malta, whichever is nearest, and await orders from the Commander-in-Chief.

As the risk involved in allowing both sides to manœuvre at night without lights outside Argostoli was considered to be too great, the ships of X fleet (other than destroyers and torpedo boats) were ordered to carry navigation lights within a radius of 50 miles from the port, and as some compensation they were to be immune from torpedo attack at night within that area.

Remarks on the rules.

These rules, some of which are definitions and instructions rather than rules proper, seem to call for little comment, with the exception of the final provision. There are always risks involved in allowing ships to manœuvre at night without lights. But these risks would of a certainty be run in war, and they have been run with immunity in the manœuvres of many years. The Ionian Sea is nothing like such a crowded waterway as the English Channel, and yet in the manœuvres of 1901 two large fleets were manœuvred in the Channel for several nights without lights and with no mishap whatever. If the risk was thought too great to run, the rule should surely have been made applicable to both sides. The proceedings would not have been made thereby a whit less like real war than they were made by applying such a rule to one side alone. The compensating immunity from torpedo attack conferred on the escaping ships, so long as they were compelled to carry navigation lights, was in a large measure illusory, since a hostile destroyer, which had sighted the fleet within the area of immunity, had only to follow it until its lights were extinguished and then deliver its attack; and a destroyer adroitly handled could easily do this without being herself observed. As a matter of fact, the only recorded effect of the rule was to expose the flagship of the X fleet to an attack from one of her own destroyers, an attack delivered within the area of immunity "owing to a subordinate losing his head and mistaking the *Implacable* for one of the enemy's ships." "It is," as the official narrative very properly remarks, "most unlikely that this would have happened in war, for the destroyer, which was in sight long before she attacked, would have been fired on without waiting to ascertain whether she was friend or foe." On the other hand, as the X fleet was observed by the Chamois as it issued from Argostoli, there is nothing to show

that at least one of its battleships might not have been torpedoed if the rule had not been in force. The recent disaster to the Orwell, which occurred off Corfu in the course of night operations conducted without lights, may perhaps be taken to afford an *ex post facto* justification of the rule which was established at Argostoli. In that case, however, the conclusion is irresistible that inferences drawn from operations conducted under conditions altogether different from those which would obtain in war are vitiated at their very source. There is nothing to show that in actual war the X fleet could have escaped at all; there is not a little to show that it could not have escaped with impunity. According to Rule 4 the operations were to be " considered as an experiment to obtain correct data as to the chances of evasion on the one side and of the risks on the other." It may well be doubted if correct data are to be obtained from an experiment conducted under conditions so artificial and so very unlike the " real thing."

The following was the " composition of the fleets " :—

	A FLEET.	B FLEET	*X FLEET.**
Battleships.	BULWARK (Flag).	Majestic (Flag).	*Implacable* (*Broad Pendt*).
	FORMIDABLE.	Jupiter.	*Illustrious.*
	LONDON.	Hannibal.	*Hood.*
	CANOPUS.	Magnificent (2nd Flag).	*Victorious.*
	IRRESISTIBLE.	Mars.	*Cæsar.*
	VENGEANCE.	Prince George.	*Repulse.*
			Renown.
Cruisers.	*1st Class.*	*1st Class.*	*1st Class.*
	ANDROMEDA (Flag).	St. George (Broad Pendt.).	*Aboukir* (*Armoured*).
		Sutlej (Armoured).	
		Niobe.	
	2nd Class.	*2nd Class.*	*2nd Class.*
	GLADIATOR.	Brilliant.	*Vindictive.*
	NAIAD	Doris.	*Diana.*
	HERMIONE.	Furious.	*Juno.*
	MINERVA.		
	RAINBOW.		
	3rd Class.	*3rd Class.*	*3rd Class.*
	PEGASUS.	Pactolus.	*Pyramus.*
	PANDORA.	Prometheus.	*Pioneer.*
Torpedo Boat Destroyers.	ORWELL.	Myrmidon.	*Coquette.*
	GRIFFON.	Chamois.	*Cygnet.*
	PANTHER.	Flying Fish.	*Ariel.*
	LOCUST.	Kangaroo.	*Albatross.*
	BOXER.	Desperate.	*Cynthia.*
	EARNEST.	Fawn.	*Foam.*
	MALLARD.	Ardent.	*Banshee.*
			Six torpedo boats.
			Tyne (*Depot Ship*).

* The battleship Ramillies, detained at Malta by the illness of Rear-Admiral Watson, was supposed to be with X fleet, the strength of which for tactical purposes was therefore considered to include eight battleships.

Preliminary proceedings.

The preliminary proceedings leading to the establishment of the blockade, and the dispositions made by the commanding officers on either side, may best be described in the language of the official narrative.

NARRATIVE OF EVENTS.

After some instructive tactical and general exercises off Nauplia, in which all the fleets took part, they separated on September 22 to complete with coal—A remaining at Nauplia, B proceeding to Suda Bay, and X proceeding direct to Argostoli.

During the forenoon of September 29, all having reported ready, the Commander-in-Chief despatched a telegram from Nauplia to the senior officers of B and X fleets at Suda Bay and Argostoli respectively, which announced that war was to be declared at 6 P.M. that evening. Unfortunately the Commodore of X fleet did not receive it till 10.45 the following morning. At 6 P.M. accordingly Sir Baldwin Walker, commanding the A blockading Cruiser Division, left Nauplia in the cruiser ANDROMEDA, with the cruisers MINERVA and GLADIATOR and the battleship VENGEANCE (all belonging to A fleet) in company, steaming 15 knots for Argostoli. The A destroyers had preceded him at 17 knots, as it was possible that some of the X destroyers and torpedo boats might attack the A fleet while passing through the Cerigo Channel. At midnight all lights were distinguished, and the MINERVA was sent on under orders to be off Navarin at daylight, in order to cut off any X destroyers that might be making for that port, and reconnoitre the anchorage if possible.

The remainder of A fleet left Nauplia at 6.15 P.M. the same evening to take up their blockading station off Argostoli.

The B fleet sailed from Suda Bay at 6 P.M. also to commence their blockading duties. Their destroyers were taken in tow by the larger ships, but had to be cast off during the night owing to a rising sea.

At daylight on September 30 the two fleets were in sight of each other off Cape Matapan. Each proceeded independently to its station, the A battleships arriving at 3 P.M. and the B battleships, which had further to go, somewhat later. The cruisers got into position later still, and the destroyers last.

The general arrangements for the blockade were as follows: A fleet watched the area eastward of a line drawn S.W. ½ S. from the centre of the entrance to Argostoli Harbour, covering the Zante Channel and Navarin, with an appointed rendezvous in latitude 37° 30′ N., longitude 20° 25′ E.

B fleet watched the area westward of this line, with a rendezvous in latitude 37° 30′ N., longitude 19° 51′ E.

The destroyers of A and B on alternate nights took the duty of forming the inshore watch close off the harbour's mouth, and on other nights those of A fleet occupied the Zante Channel with orders to attack the X fleet if they passed the 50-mile immune limit, and those of the B fleet were disposed as their Admiral thought desirable.

The A and B cruisers were assigned positions outside their destroyers, but inside their battleships, so arranged that they formed a screen between the latter and the hostile destroyers. As the A cruisers were all unarmoured ships they were supported on alternate nights by the battleships CANOPUS and VENGEANCE.

The rendezvous chosen for A fleet was in such a position that it could cut off X if the latter passed to the eastward, and was about the same distance if they passed to the westward, as the harbour's mouth was from Cape Spartivento. At the same time, it was sufficiently far from the fortified X ports at Zante and Navarin to make it somewhat difficult for X destroyers to operate against the A ships from those points. B fleet's rendezvous was about 30 miles to the westward of this.

By daylight the blockading fleets moved in off Argostoli, and the respective flag officers conferred with each other. At these times the ships were plainly visible from the blockaded harbour. Claims arising out of the previous night's operations were considered, and when necessary telegraphed through a neutral station at Zante to an officer inside Argostoli representing the Commodore of X fleet. A representative was necessary as a means of concealing from the blockaders the knowledge as to whether X fleet was still inside or not.

Coaling was successfully carried out from time to time by the blockading cruisers and destroyers from colliers or battleships at the sea rendezvous.

All lights in the blockading fleet were extinguished at night. Steam for 16 knots was always kept ready at 40 minutes' notice, and the whole blockading plan was dependent upon a rapid transmission of the intelligence of an escape of X by the watching cruisers and destroyers of A and B.

As regards X fleet, the Commodore acted on the assumption that as he was supposed to represent the officer commanding a fleet, whose principal object was to effect a junction with another fleet at a prearranged time on a sea rendezvous, it would be necessary for him to fix exactly beforehand his time and direction of escape, if he was really to reproduce the conditions of war, and that having settled these matters no subsequent events or circumstances should change or influence them. He also decided that before being able to attempt to break away from a closely invested port with any chance of success, it would be necessary to allow a certain time to elapse, for the double purpose of weakening the enemy morally and physically, and of locating his forces. He therefore fixed his hour of departure for 8 P.M. on October 4, and having come to the conclusion that for certain reasons such a course would add to the realism of the whole manœuvres, chose his western goal at Palmas Bay as the point for which to steer.

On receiving intimation on September 30 of the declaration of war, X fleet moved up the S.E. arm of the harbour and moored at 1¼ cables intervals, close to the town of Argostoli, where they were entirely concealed from the ships outside. A signal station was established on the hill (320 feet high) overlooking the approaches to the harbour, and connected, as well as the Argostoli telegraph office, to the *Implacable* by telephone, the latter of these for the purpose of transmitting reports received by cable from Zante signal station. The *Pyramus* was despatched to land the party detailed to establish the latter station, with orders to explain, if interfered with, that the time lost in receiving the telegram declaring war accounted for the delay in taking this step. A coast guard of 28 officers and 350 men, with necessary equipment, were landed to patrol the whole sea front of X territory in Cephalonia, from Cape Aterra to Cape Scala, and the *Aboukir* picketed the road on the N.E. side of the harbour overlooking the war anchorage. These arrangements prevented the blockaders from landing spies to ascertain if the defenders were still in the harbour.

As the plan of operations determined on by the commodore involved a fixed and unalterable date for his attempt to force the blockade, there is nothing to record of the proceedings of his larger ships until that date was reached. They lay hidden within the anchorage, while a keen warfare was being waged by his torpedo craft and smaller cruisers against the blockading forces outside. The dispositions of the latter would seem to have been well conceived, though, to judge by the result, the arrangements subsidiary to them must have been faulty, or at least insufficiently co-ordinated. A close watch on the port was maintained by a force of destroyers. The headquarters rendezvous was in lat. 37° 30′ N. and long. 20° 25′ E., about fifty miles from the entrance to Argostoli, and very nearly due south of it, and that of the B fleet was about thirty miles to the westward, the two fleets being so disposed as to cover the alternative courses which the X fleet must take when making either for the meridian of Kos to the eastward, or for that of Palmas to the westward. The cruisers of the respective fleets were disposed nearer to Argostoli, so as to form a screen between the battleships and any destroyers of X which could run the gauntlet of the blockading destroyers stationed immediately off the harbour's mouth. As no battleship was either torpedoed or attacked, and as very few even of the blockading cruisers were made the subject of any torpedo claim, it may be assumed that this general disposition was judicious if the sole object was to avoid casualties of that kind. Nevertheless, it was not successful in its main object. It failed to prevent the escape of the blockaded fleet. It is important

Remarks thereon.

to consider, therefore, how far the dispositions made or any of the arrangements subsidiary to them were responsible for this result.

Remarks continued.

"The whole blockading plan," says the official narrative, "was dependent upon a rapid transmission of the intelligence of an escape of X by the watching cruisers and destroyers of A and B." The watching destroyers had no other function to discharge than this. They could not attack the escaping ships of X within the 50-mile limit of immunity. They could only observe them, and that was what they were there to do. Having observed them, the choice lay open either of following them beyond the 50-mile limit, and then attacking them, or of going off at once to inform the Commander-in-Chief of their escape. The latter was obviously the right course to pursue in the circumstances, but there were many obstacles to its successful pursuit, some, perhaps, gratuitously interposed. There is no operation of naval warfare more difficult to conduct successfully than that of a watching blockade—a blockade having for its object to ensure bringing a hostile fleet to action if it issues from the shelter of its harbour defences. But there are certain measures and precautions which cannot safely be neglected. The first and most important of these is that the whole of the blockading forces should be controlled by a single mind, and co-ordinated on a single and uniform plan. This indispensable condition was satisfied rather in the letter than in the spirit by the blockading fleets off Argostoli. "The Mediterranean Commander-in-Chief, Sir Compton Domvile, was in command of the whole of the blockading forces, with A fleet under his personal orders, while B was under the orders of Vice-Admiral Sir Arthur Wilson." This is a very different thing from a single undivided command, and the difference found practical expression in the stationing of the two fleets to watch more or less independently on either side of an imaginary line with a separate rendezvous for each. Many further illustrations of this unnecessary and impolitic weakening of the supreme control of the blockading forces will be noted in the sequel.

The conflict of torpedo craft.

We have seen that the plan of campaign adopted by the Commodore required him to make his escape at a pre-determined moment, and to allow no subsequent events or circumstances to change or influence his intended movements. It follows that, until this predetermined moment came, the interval must be occupied mainly with the alarms and excursions of torpedo craft, so familiar to all who have studied the history of naval manœuvres in these latter days. Unfortunately, this preliminary skirmishing of torpedo craft is almost of necessity the most unreal part of all operations of the kind. And yet, if it could be invested with some semblance of reality,

it should yield lessons of the most transcendent importance. It is of the utmost moment to ascertain, as far as may be, what the real effect of torpedo conflict will be when the guns are firing in earnest and the torpedoes are fitted with their war-heads. There must always be an element of uncertainty and unreality until this is the case, but it should be minimised as much as possible. It is not minimised, but, on the contrary, it is largely increased by a system of umpiring which refers all disputes to a body of umpires sitting at a distance, and seldom giving their decisions until after the operations are over. Unless the umpiring is automatic and instantaneous, as the decision of actual warfare would assuredly be, it is futile for all practical purposes. The only way to invest it with this character is to make the senior officer present in any conflict the sole arbiter of the result. He must needs be a party to the dispute, and subject to strong bias; but a high sense of duty should go far to abate this disqualification, and after the close of the operations his decisions might be subject to the review of some impartial authority, so that, if he were found to have yielded to any undue bias in his own favour, he might be made to understand that such conduct was neither to his own advantage nor to the credit of the service. But his decisions should for the time being be final, and no vessel ruled out of action by this method should be allowed to take any further part in the proceedings. Such a rule was apparently in operation during the Argostoli operations, but it does not seem to have been very rigidly enforced. The first of the "Instructions for Umpires" enacted that "The Senior Officer present will always act as umpire during the operations, and decide on the spot which ships are out of action . . . . reporting the cases to the Commander-in-Chief."

Its unreal character.

Now on the first night of the blockade the B destroyers Chamois, Ardent, and Myrmidon were especially active and perhaps a little incautious. The Chamois first attacked five of the X destroyers, mistaking them for torpedo boats, but retreated on discovering her mistake. Next the Ardent attacked two torpedo boats, and as the forces were equal under the rules, both sides were subsequently adjudged, by umpires appointed to review all the claims after the close of the operations, to have been put out of action, though both enjoyed immunity at the time. The Ardent next claimed a torpedo boat, but the claim was disallowed by the umpires as she was already out of action. Next the Chamois attacked what she took for three torpedo boats, but as they proved to be destroyers, and she was also under fire from supposititious batteries on shore, she too was subsequently declared by the umpires to have been put out of action. This however did not

prevent her at the time from joining with the Myrmidon in attacking two X destroyers, which the Myrmidon at any rate mistook for torpedo boats, and claimed as such; and as she was, according to the umpires, already out of action, the Myrmidon of necessity incurred the same penalty as having been engaged with a superior force and also under fire from the shore batteries. Thus three out of the seven B destroyers were really out of action within twelve hours of the establishment of the blockade. But this belated verdict had no effect whatever on their proceedings.

Defects in umpiring.

After the operations were over thirty-nine claims in all were considered by the umpires. Of these, the first was preferred by the Chamois and disallowed. The fifth, arising on the same night, was preferred against her, and resulted in her being declared out of action. Nevertheless, three other claims were preferred against her in the course of the next three days, and she herself advanced one, all these being ultimately disallowed. Finally, it was the Chamois which, on the night on Oct. 4, observed the escape of the X cruisers, and two hours later that of the X battleships, and then spent the remainder of the night in a fruitless endeavour to convey the information of their escape to the Commander-in-Chief. Proceedings such as these are simply futile. They reduce the operations involved to the level of a burlesque. It is not easy to say where an effective remedy can be found; but if the senior officer present cannot be trusted to give an equitable decision on the spot, or if the confusion of a night action makes it impossible for him to give any decision at all, or to enforce it when given, we must abandon all hope of obtaining any profitable instruction in peace as to how, and with what results, torpedo conflict will be conducted in war. The rather grotesque expedient of referring all undecided claims to the Commander-in-Chief of one side would hardly seem to be justified by the results. There were many conflicts on the night of Oct. 2–3. "As the result of the night's fighting the Commander-in-Chief decided, on the 3rd, that the destroyers *Coquette*, *Cygnet*, and two others, the torpedo boats *92*, *93*, and *94*, and the *Hood's* picket boat were out of action on the X side, and he ordered the B destroyers Flying Fish and Desperate to remain out of action pending the decision of other claims. . . Subsequently some of these verdicts were reversed by the umpires, who gave as the result of the night's work the A cruiser PEGASUS, the B destroyers Flying Fish and Desperate, and the X torpedo boat *91*, as being the vessels put out of action." From such conflicting decisions no safe inference whatever can be drawn. It appears that whereas some claims were decided on the spot, and others provisionally decided by the

Commander-in-Chief on the day after the occurrence, many were left to be decided by the umpires after the operations were over, the vessels affected by them remaining in action throughout. Moreover, all the claims, whether previously decided or not, were reviewed and revised by the umpires subsequently.

Their misleading consequences.

To describe such a method is to demonstrate its futility. A single destroyer left at large after she has properly been put out of action may alter the whole complexion of affairs and materially affect the final result. It was, as we have seen, the Chamois that observed the escape of the X battleships, and it will be seen in the sequel that it was not her fault that the Commander-in-Chief was not forthwith informed of it. This happened on the night of October 4th, and yet the Chamois had really been put out of action on the morning of October 1st. It may be said that if the Chamois had been disqualified another destroyer would have taken her place. But the number of destroyers was not unlimited, and the substituted destroyer could not have been in two places at once. If the Chamois had been disqualified, either no destroyer would have been on the spot or some other critical point must have been left unguarded. Besides, one destroyer is not necessarily as good as another. The whole proceedings of the Chamois show that she was very skilfully and energetically handled. It makes all the difference to the result whether it is a Nelson or a Calder that is put out of action.

The umpires' decisions.

The net result of the umpires' final decision is recorded as follows :—

The total losses during the operations were estimated by the umpires as follows :—

A Fleet.—Cruiser PEGASUS, destroyers MALLARD and PANTHER.
B Fleet.—Cruiser Doris, destroyers Ardent, Chamois, Desperate, Fawn, Flying Fish, and Myrmidon.
X Fleet.—Destroyers *Ariel* and *Banshee*. Torpedo boats *91*, *92*, and *93*. Disguised collier *Rowtor*.

In addition to the above, sea-going strength of X fleet was diminished by one battleship, the *Hood*, owing to an accident, and that of the A fleet also by one battleship, the IRRESISTIBLE, owing to a breakdown.

Thus in five days the blockading fleets were adjudged to have lost eight out of their fourteen destroyers, while the X fleet lost only two out of seven and three torpedo boats out of six. If any safe inference can be drawn from these figures, it must be that blockading fleets which rely on their destroyers in keeping a close watch will very soon find that they are leaning on a broken reed, and that for this reason the commander of a blockaded fleet will postpone his escape as long as he possibly can. But the method by which the figures in question were obtained was so dubious, and so little

analogous to the procedure of real warfare, that by far the safer inference would be that they prove nothing at all.

A questionable *ruse de guerre.*

The story of the "disguised collier *Rowtor*" is instructive, though of doubtful example for imitation in actual war.

The same evening the collier *Rowtor*, disguised as a German steamer by X fleet, left the harbour with an officer and signalman from the fleet on board, and X torpedo boat *92* lashed along her starboard side. She steamed about 40 or 50 miles to the W.N.W., and first passed a four-funnelled and a double-funnelled cruiser in company, at which the torpedo boat was slipped. Too much time was lost in this, however, so the attack was not made, and the boat returned alongside the collier. The *Rowtor* then steamed to the southward, and shortly after sighted the B cruiser Sutlej and another cruiser apparently of the P class. The torpedo boat was again slipped and attacked. She was sighted from the Sutlej and fired on for three minutes before discharging her torpedo, both cruisers steaming off at full speed, but the torpedo struck the Sutlej, and torpedo boat *92* returned to the harbour, where she arrived at 9.45 A.M. the next day, after being sighted by the A cruiser ANDROMEDA, which unsuccessfully tried to cut her off. The *Rowtor* proceeded to Navarin, to which place she had been ordered, and despatched a telegram thence to the Commodore of X fleet, reporting all that she had observed of the dispositions of A and B. She then left Navarin to return by a circuitous route to Argostoli. It is instructive to note that the telegram did not reach its destination till after X fleet had sailed, more than two days subsequently.

* * * * * *

At 4 P.M. the disguised collier *Rowtor*, which had gone out on the night of the 1st, returned and made her report. She had been to Navarin and back, and passed through the A battleship fleet at their rendezvous that same morning. On her return to Argostoli her disguise deceived the officer of the guard of her own fleet, who addressed the master in German when he boarded her.

Obviously the cruise of the *Rowtor* would have come to an end in war when she first slipped her torpedo boat.

Conditions essential to the success of a blockade.

At last, after four nights and days of this rather make-believe preliminary skirmishing, the time came which the Commodore had fixed for making his escape. This was the night of October 4. The Admirals of A and B fleets had met and conferred in the course of the day, and had "come to the conclusion that it was probable that the attempt to break the blockade would be made that night." By this time, and in these circumstances, it should surely have been possible so to dispose and organise the blockading forces as to make sure that, should the anticipated attempt be made, the Commander-in-Chief should be informed of it with the least possible delay. There were two specially organised cruiser squadrons among the blockading forces, and the special function of a cruiser squadron is, or should be, to collect intelligence with precision and transmit it with promptitude. Had an efficient and uniform code of private signals been devised beforehand, there was time to have practised it assiduously and to have made sure that every ship in the blockading fleets understood it thoroughly and could use it without confusion. As it would of course be taken for granted that the escaping fleet would employ many devices for confusing and misleading its opponents, by firing guns and rockets, by a lavish display of searchlights, and, above

all, by a continuous use of wireless telegraphy, so as to break up or confuse all the blockaders' messages, there was time to think out some method of neutralising these devices, or at least of minimising their effect—possibly by silencing all wireless messages and forbidding the use of the searchlight altogether. A blockading fleet should be animated by the spirit of a single man, and should respond instantly and almost spontaneously to the inspiration and control of a single mind. There is no room for haphazard methods, for blind reliance on the chances and opportunities of the moment. Lack of co-ordination is fatal. Every unit should know its business, and allow nothing to interfere with its instant and strenuous prosecution. Five minutes lost may, as Nelson said, make the difference between a victory and defeat. Everything should give way to the paramount necessity of letting the Commander-in-Chief know what has happened without a moment's delay. Every ship in the fleet should know exactly where to find him, and should also know how best to transmit her information to him if she cannot leave her station. Unless a blockading fleet is organised in this fashion it is organised for failure.

These conditions not satisfied.

The blockading fleet off Argostoli was not organised in this fashion. It was not animated by a single mind nor responsive to a single inspiration. The divided command has already been mentioned, and its inherent evils were not cured by the frequent conferences of the Admirals who shared it. How far the other conditions enumerated above as essential to the success of a blockading fleet were satisfied will best appear in the sequel. The first result of the conference between the Admirals on October 4, and of the conclusion they then came to that an attempt to break the blockade would be made that night was that "the B cruisers were moved nine miles further in . . . and the A battleships, instead of going to their usual night position, moved up behind their line of cruisers." This may have been a good move in itself, but it was surely a very bad move to make without giving due notice to the whole blockading fleet. For five days the headquarters rendezvous of the Commander-in-Chief had been in a certain position well known to every unit in the fleet. Without notice, and, apparently, without leaving a single vessel there to tell other vessels bringing him intelligence where to find him, the Commander-in-Chief, on the critical night of the blockade, on the very night already adjudged by himself to be critical, alters the station of his battleships, and deserts his appointed rendezvous. No possible advantage to be derived from being nearer to the blockaded port could justify such a proceeding, because unless he could make sure of seeing the escaping fleet with his own eyes—which was obviously out of the question—and of pursuing it at once,

it was certain that the intelligence of its having escaped would take longer to reach him. As a matter of fact it took all night. It was not five minutes but nearly twice as many hours that were lost by this desertion of the rendezvous, and with them, as the sequel showed, was lost the chance of bringing the escaping fleet to an action before the junction of its reinforcements. In war such a proceeding might well mean the loss of the whole campaign.

The Commodore's plan.

The Commodore's first step in breaking the blockade was to send out his destroyers at dusk for the purpose of driving off any of the enemy's destroyers which might be found on the watch, and so to clear the way for his fleet which would make its exit later. This was accomplished with some measure of success, though the Chamois, which was at first driven off with two of her consorts—one of which was captured—managed to return to the neighbourhood of Argostoli in time to witness the next act of the drama—namely, the exit of the larger cruisers of the X fleet at 7.30 p.m. These were ordered to break out and "stand to the south-eastward right through the Zante Channel with the object of deceiving the blockaders into the belief that they were the X battle squadron endeavouring to make for the eastern objective at Kos." They carried their proper navigation lights in accordance with the rule to that effect; but to further the deception they carried a second set right aft, but facing forward in the same direction. Such an artifice was not perhaps inadmissible in peace manœuvres subject to the rule aforesaid; but manifestly it could have no purpose or effect in war, since no ships in actual warfare would be likely to carry navigation lights at all when attempting to break a blockade. The cruisers were first observed shortly after their exit by the ubiquitous and invulnerable Chamois, but recognising them as cruisers she remained at her post. At 9.30 they were again observed by the Myrmidon, also a destroyer, which had been put out of action on October 1 but was still at work. The Myrmidon was "taken in by the double lights, and at once steamed to the westward, signalling to the B cruisers 'eight battleships and four cruisers standing S.E.'" Now, the Myrmidon, although attached to the B fleet, was well within the area specially assigned to the A fleet for observation. She was therefore much nearer to the A cruisers and the headquarters of the Commander-in-Chief than she was to those of her own Admiral. Why she did not carry her intelligence to the Commander-in-Chief direct is not explained, especially as the Chamois, belonging to the same fleet, pursued this very proper course when at a later hour she observed the real exit of the X battleships. But the Myrmidon seems to have

thought that, being under the immediate orders of the B Admiral, she must make her report to him. Her signal was observed by the B cruiser Niobe, which endeavoured to pass it on, "but being a B cruiser, and therefore belonging to the squadron whose particular duties lay to the westward of the dividing line, she remained at her station, expecting that if there was to be a chase to the S.E. she would receive a signal from the B Admiral to that effect." It was rather a nonchalant thing to do, and the whole incident illustrates very forcibly the evils of divided command, but as the information brought by the Myrmidon was altogether misleading no great harm was done.

Progress of the X cruisers.

By this time the X cruisers were approaching the Zante Channel. Here they were observed by the GLADIATOR and PEGASUS, cruisers belonging to the A command, and by several A destroyers. The GLADIATOR satisfied herself that the escaping ships were cruisers, and not battleships, and then steamed off to inform the A cruiser Admiral of what she had seen; but she "struck the cruiser line too far to the north, and, failing to find him, she returned to her station." Truly the happy-go-lucky, hit-or-miss ways of these cruisers are very astonishing. Either the information conveyed by the GLADIATOR was important or it was not. If it was not, she need not have troubled to convey it; if it was, she ought not to have returned to her station without making every possible effort to find the Admiral and communicate it to him. The PEGASUS, on the other hand, mistook the X cruisers for battleships, and followed them up under that impression, "flashing the pre-arranged signal to that effect in the direction of the Admiral," this being her only available means of communication, as the X cruisers were, of course, using their wireless apparatus incessantly, and thereby blocking all signals made between the A ships by the same agency. The A destroyers, watching the Zante Channel, were also deceived, and followed the X cruisers unobserved, believing them to be battleships, and intending to attack them as soon as they were beyond the 50-mile limit of immunity. In the meanwhile they detached the GRIFFON "to make the pre-arranged rocket signal indicating escaping battleships, or convey the information to the proper destination by any means she could." They were undeceived, however, before they reached the 50-mile limit. The *Aboukir*, senior officer's ship of the X cruisers, had been ordered to fire three rockets shortly before the 50-mile limit was reached, in the hope that this or some similar signal might prove to be the signal adopted by A to indicate escaping battleships. "By a curious coincidence three rockets happened to be the very signal that had been arranged, and the deception was to some extent successful,

inasmuch as it drew several of the A cruisers to the S.E. to investigate." As soon as the rockets had been fired, the other X cruisers fired minute guns, according to orders, with a similar intent to deceive, "whereupon the chasing destroyers, thinking they were observed and fired on, disclosed their presence by Very's lights. Shortly afterwards, discovering that they were following cruisers and not battleships, they gave up the pursuit, and stood back towards Argostoli again."

A cruisers in pursuit.

The zeal displayed by the PEGASUS and GRIFFON in conveying false information was not without its reward. The remaining adventures of the X cruisers and of the A cruisers in fruitless and misguided pursuit may best be described in the language of the official narrative:—

The signals from the PEGASUS and GRIFFON were observed from the A cruiser flagship ANDROMEDA, which immediately proceeded, in company with the A cruiser PANDORA, to investigate matters to the south-eastward. While standing in that direction they met the A destroyer ORWELL, which, as above stated, had given up chasing the escaping vessels on discovering they were cruisers. The ORWELL reported the true facts of the case, but as the PEGASUS continued to follow the X cruisers and flash the signal for battleships, the Admiral decided that he was bound to verify these signals. He therefore first despatched the ORWELL to convey to the Commander-in-Chief such information as he had, and then shaped a course at full speed by which he knew he must cut off the X battle squadron if they were steering to round Cape Matapan. This led to no result, as there were neither battleships nor cruisers in that direction, for the X cruisers, on getting rid of the destroyers and reaching a pre-arranged point, had altered course to the westward and dispersed, with lights extinguished, to make the best of their way independently at full speed for their objective rendezvous west of the meridian of Palmas Bay. Here they all arrived in safety by 6 P.M. on October 6, within an hour of their own battle squadron, and about 46 hours after breaking out, except the *Diana*, which was somewhat later.

Finding no signs of X ships of any kind to the S.E., the ANDROMEDA and PANDORA eventually altered course to the northward again for Argostoli, off which they arrived next morning, and learnt from the ship left behind for that purpose that the X battleships had escaped during the night and gone west. Admiral Walker at once started in pursuit, and tracing the direction of the chase by the smoke of the long line of vessels ahead of him, overtook the A and B battle squadrons, and arrived off Palmas Bay at 7 P.M. on the 6th, about an hour after the last of the X ships, except the *Diana* and *Juno*, which he passed.

Of the remaining A cruisers the NAIAD, HERMIONE, and MINERVA joined the A battle fleet in the morning when the latter started westward in pursuit, as described hereafter. The PEGASUS, having continued to chase the X cruisers in the belief that they were battleships, discovered her error by 2 A.M., and returned to the A rendezvous in time to join her battle squadron in the chase also. The RAINBOW observed the false rocket signals made by the X cruiser *Aboukir*, and heard the guns of the *Aboukir's* consorts, and her commanding officer was deceived into repeating the rocket signals and leaving his station without orders to ascertain what was going on to the south-eastward, where he remained until daylight. Returning next morning to the rendezvous he heard that X fleet had escaped westward, followed by A and B, and started to catch up the latter, which he did on the night of the 6th. Had the RAINBOW not thus left her patrol, it is probable that the GLADIATOR'S efforts to find the ANDROMEDA and give information that the vessels escaping to the south-east were cruisers would have been successful, in which case the A cruiser Admiral would not have been drawn off on a false scent. The GLADIATOR, Furious, and PANDORA were short of coal, and could take no part in the chase.

The proceedings of the RAINBOW illustrate once more the imperfect control exercised over ships which should all have been animated by a single purpose, and subdued to a single will. But the apology offered for the GLADIATOR, though plausible, is hardly convincing.

She failed to find the ANDROMEDA because the ANDROMEDA, with the PANDORA, had been decoyed off on a wild goose chase. But the NAIAD, HERMIONE, and MINERVA still remained at their stations, and the Commander-in-Chief himself was not far distant. He had moved up with his battle squadron behind the line of his cruisers. It is not apparent why the GLADIATOR, having failed to find the ANDROMEDA, should have returned to her station without communicating either with the Commander-in-Chief or with some of her consorts still remaining in the cruiser line. There may be very good reasons for this, but as no such reasons are given, the general muddle of the night suggests itself as the most plausible explanation.

Anyhow, the X cruisers managed to get clear away. The same good fortune attended the X battleships. They weighed at 7.50 P.M., but in turning in the very narrow anchorage the *Hood* gathered sternway and touched bottom with her rudder, thereby fracturing the rudder-head. She was accordingly left behind, and took no further part in the operations. Subsequently she was navigated first to Malta and afterwards to England by means of her twin screws only. This mishap delayed matters a little, and it was not until 9.30 P.M. that the battle squadron finally got clear of Argostoli, and shaped course for Cape Spartivento at 15-knots speed. Their exit was observed by the Chamois, which, having first ascertained the course they were steering, started off at once to find the Commander-in-Chief, and give him this all-important information. But the Commander-in-Chief was not to be found. He had quitted his rendezvous and left no address. All that the Chamois found were the A destroyers BOXER and GRIFFON, which had come from the Zante Channel on the same bootless mission, and the three having exchanged intelligence, separated to prosecute their search, which was continued throughout the night with no better success. **Escape of the X battleships.**

Some two hours after leaving Argostoli the X battleships had reached the B cruiser line, and were sighted by the St. George, which occupied the centre station in that line. The St. George passed on the information to the Pactolus, the next ship in the line in the direction of the B flagship, and after some delay the Pactolus passed it to the Brilliant. The Brilliant attempted to pass it to the Furious but failed. Why she failed is not explained. Cruisers attached to a fleet exist mainly for the collection and transmission of intelligence, and if they fail in the discharge of that function they are no use at all. It would be very interesting to know what the Brilliant was doing at this critical juncture, but the official narrative is silent on the point. Its silence, if not significant, is unaccountable. Anyhow, more than two hours after the St. George had observed the X fleet **Observed by the B cruisers, but with no result.**

she ascertained from the Brilliant that the B Admiral had not received any intelligence on the subject. The commanding officer of the St. George then "stood towards the B fleet's night position to endeavour to get in touch with the Admiral himself." "His searchlight was seen from the B flagship, but as searchlights were at work, and rockets and guns were being fired in all directions, the signalling from the St. George was misunderstood and thought to be a device of the enemy. It was not, therefore, answered." This is really astounding. Next to a fixed and unalterable rendezvous the most essential thing for a blockading fleet to have is a clearly intelligible code of private signals. The enemy is certain to employ searchlights, rockets, guns, and every other agency at his command with intent to mislead and confuse. But a well-conducted fleet should not be at the mercy of these commonplaces of blockade. They were employed with great effect by the late Sir George Tryon at the blockade of Bantry Bay in 1888; but the Navy should have learnt a great deal since then. The St. George finding her signals unanswered came to the conclusion that the B Admiral, having obtained the information from some other source, had started off in pursuit of the enemy. She accordingly followed suit and started off herself. As a matter of fact it was not until 7 A.M. the next morning that the B Admiral first received from the Brilliant—whose proceedings throughout the night are so unaccountable—the intelligence that the X fleet had passed the St. George steering westward more than seven hours previously.

No information reaches the Commander-in-Chief.

So far then no cruiser or destroyer of any of the blockading fleets had succeeded in informing either her own Admiral or the Commander-in-Chief of the escape of the X battleships. The Admiral of the A cruisers had gone off in a vain pursuit of the X cruisers, misled by the signals of the PEGASUS, which declared them to be battleships. The Commodore of the B cruisers had gone off in an independent pursuit of the X battleships, having failed to communicate any intelligence to the B Admiral, whom he wrongly assumed to be engaged in the same pursuit. Accordingly no information reached the B Admiral during the night, and the Commander-in-Chief was nowhere to be found. The Chamois, the BOXER, and the GRIFFON spent the night in looking for him, each bearing important intelligence. The ORWELL was also looking for him, having been despatched by the A cruiser Admiral to convey the news of the escape of the X cruisers to the south-eastward. It was not until 5.30 A.M. that the ORWELL found the BULWARK, the flagship of the Commander-in-Chief, and imparted her information, which was the first intimation he received that any of the X ships whatever had escaped. Less

than half-an-hour afterwards the BOXER also found the BULWARK, and communicated the information, obtained from the Chamois, that the X battle squadron had broken out during the night and gone westward. Then at last, nine hours after the bird had flown, the pursuit was begun. The A battleships first steamed at full speed to the northward and picked up the B fleet at 7 A.M., just as it had received the same belated information from the Brilliant, and both fleets then started straight for Palmas Bay in pursuit.

The pursuit fruitless.

But it was too late; the golden hours of the night had been thrown away partly by the Commander-in-Chief's unfortunate change of rendezvous, partly by the imperfect organisation of the signalling arrangements of the blockading fleets, and they could not be recovered. The A battleships being the faster the Commander-in-Chief decided to go on ahead with them at 17 knots, hoping to be able to overtake the enemy before he had reached his objective; and though he would in that case have had to engage X with an inferior force, yet as after an engagement the speed of X would have been reduced to 10 knots by the rules, it was thought that B fleet coming up astern might be able to complete the discomfiture of X before the operations were brought to an end. But it was not to be. After maintaining a speed of 17 knots until the following day it was found that two of the ships could not maintain it any longer, and the IRRESISTIBLE ultimately broke down. The pursuit was then abandoned, and easing down to allow the B fleet to come up with him, the Commander-in-Chief anchored both his fleets in Palmas Bay at 8 A.M., some fifteen hours after the X battleships had passed the meridian of that anchorage. All the X cruisers except the *Diana*, which had had to ease down, arrived at the same point within an hour of the Commodore, two being already there. The only one of the blockading cruisers which witnessed the arrival of X was the St. George, which reached the meridian of Palmas Bay at 5.30 P.M. on the 6th. As already mentioned she had started off in independent pursuit some hours before any of her consorts. She passed one or two of the rearmost of the X cruisers as they neared the common goal, but she does not seem to have molested them. The remainder of the A and B cruisers had either accompanied their respective flags or had joined them in the course of the pursuit.

Proceedings of X.

With the exception already mentioned of the accidental torpedoing of the *Implacable* by one of her own destroyers, the X battleships were not molested in any way after they had got clear of the blockading cruisers. They started at 15 knots, but this speed could not be kept up for more than four hours, as the *Repulse* was in difficulties, and eventually it had to be reduced to 13 knots. On approaching the

Straits of Messina three of the faster battleships were sent on at 15½ knots, the *Repulse* following at 13. The *Renown* was stationed three miles astern of the *Repulse*, and the Commodore in the *Implacable* brought up the rear, three miles astern of the *Renown*, the object of this disposition being to enable the *Repulse* to get out of sight to the northward if a pursuit should be threatened, while the *Renown* and the *Implacable* would rejoin their consorts ahead, at a speed equal to that of any of the pursuing ships. In this order the X fleet reached its position of safety some fifteen hours before its pursuers—with the exception of a couple of cruisers—appeared on the scene.

Conclusion. "The manœuvres were thus brought to a conclusion by the success of X fleet in attaining their object within the given time limits." It was laid down in the rules that "the operations must be considered as an experiment to obtain correct data as to the chances of evasion on the one side, and of the risks on the other, and not as a question of defeat or victory on either side." The risks incurred on the blockading side were not apparently very great, though their true measure was not ascertained until after the operations were over, and then only approximately owing to the method of umpiring adopted. The fighting force of the A and B fleets was not very seriously diminished by the loss of one second-class and one third-class cruiser, but its watching power must have been very materially impaired by the loss of eight destroyers out of a total of 14. The X fleet was adjudged to have lost in the same time two destroyers—one of which was only put out of action after the X fleet had escaped—and three torpedo boats, leaving five destroyers and three torpedo boats still in action. It seems to follow that the closeness of the watch that can be maintained on a defended port by a blockading fleet by means of destroyers will be very rapidly impaired by an aggressive and energetic enemy, so that every day that the blockade lasts largely increases the enemy's chances of successful evasion in the end. But though it is probable that a blockaded fleet so situated will always be able to make good its escape, it certainly does not follow that it will always, or even often, be able to do so without being overtaken and brought to an action. The very object of a blockade of the kind is not to shut the enemy up indefinitely, but to get him out as soon as possible. He will, perhaps, seldom attempt to get out if his adversaries are decisively superior in force, and he has no reinforcements to meet when he makes his escape. But if he has in view a strategic combination which, if successfully accomplished, will readjust the balance of force in his favour, he will always attempt to escape as the time for the proposed combination approaches.

That is the psychological moment for which the blockaders will wait, and for which they must be prepared. In the operations off Argostoli, the A and B fleets were well apprised of this moment, but it can hardly be said that they were well prepared for it. On the contrary, it must be acknowledged that they were singularly ill-prepared for it. They were not concentrated in immediate readiness for instant and concerted action. They were not in close and organic touch with their cruisers, scouts, and other look-outs. They were not organised and trained for a vigilant and effective watch, and their means of transmitting vital information to headquarters were not only deplorably ineffective, but were rendered wholly nugatory by an unexpected and unnotified change of headquarters at the last moment. Before we can determine the "correct data as to the chances of evasion," these characteristics of the operations as conducted must one and all be eliminated, because not one of them was inherent in the nature of the operations undertaken. But their lessons are invaluable. We know now how to conduct a blockade so as to give the enemy far too many chances of escaping. We should know in future how to conduct it so as to give him as few chances as possible.

JAMES R. THURSFIELD.

CHAPTER IX.

The New Naval Scheme.

Lord Selborne's Memorandum.

Lord Selborne's Memorandum concerning the changes introduced by the Board of Admiralty is published in full elsewhere. It not only gives a popular exposition of the intentions of the Board of Admiralty, but also of the considerations which induced the Board to introduce changes which the First Lord of the Admiralty describes as of far-reaching importance. These reforms had long been due. Observant critics had declared again and again that the Navy must be deprived of its faith in the old form of training before any strenuous endeavour would be made to search for a new one. The power used in propelling and steering the ship, or when moving heavy weights, such as guns and boats, had been revolutionised; but the *personnel* adhered to the form of training belonging to the old motive power instead of to the ruling principle of which that form of training was merely a passing example. That ruling principle is, that officers and men must adapt themselves to their environment or to the ships in which they have to fight. It is little to the point to state that other navies followed our example. The leading navy should lead, not only for its own safety and prestige, but also because its very size compels it to spread changes over a much greater interval of time. The British Navy had become a mechanical navy, with machinery at all parts of the ship, from the armament to the motive power, and from the ventilating fans to the refrigerating machinery. At every point the application of practical science was needed. The measure of the change was recently summed up by Sir Norman Lockyer, in *Nature*, in an effective contrast. "The Army," he wrote, "is a non-scientific body with scientific corps; the Navy is to be a scientific body all round." He developed his opinion that by education he meant the studying of things instead of books. If the Navy could remain as it now is, with no fighting to do, no more perfect system could be devised to give the appearance of efficiency than the one whose death-knell has been sounded this year. It is the one most adapted to the safe navigation of ships, and is therefore the one universally adopted in the Mercantile Marine. It is simply and solely because it is unsuited to the business of fighting that it has had to give place to another which is likely to yield better results in war.

The writer, in taking part in the naval engineering controversy of past years, pointed out that the number of executive officers, while more than adequate to the work of peace, was likely to be wholly inadequate for war purposes. To mitigate the danger it was proposed to absorb the marine and accountant branches into the executive, and to train the latter in mechanical engineering, so that they could undertake all duties outside the engine-room. The number and position of the artificer class under this scheme were to be raised so that they would become the watch-keeping engineers in all ships and the heads of their department in all but battleships and large cruisers. The legitimate grievances of the engineers would thus have been removed, for they consisted in the poor outlook of promotion through the excessive number of junior officers doing watch-keeping duties, while the number of high posts available for engineers is necessarily limited. An alternative method.

In this way all the important objects hoped for under Lord Selborne's scheme would be achieved without such a revolution as assigning to the executive officer the charge of any motive power which is far removed from the position in which he does his work. For it should be remembered that the analogy derived from history of the military officer ultimately taking charge of the motive power under masts and sails is inexact. It only applies where motive power is in contact with the executive officers' work, as when the sails and the guns were both in view on the upper deck, so that the two could be controlled at the same time. The analogy is quite inapplicable to the engine-room, which is several decks below the armament.

It should be clearly understood, therefore, that the support which is given in the present chapter to the new naval scheme is in certain parts only given on the principle inculcated by Moltke, that an administration may choose a certain course which is intrinsically not the best one, and achieve success if their purpose is not weakened by vacillation or outside pressure, whereas if they had chosen first one and then another of the better courses, they would fail altogether. In the last fourteen years we have had no less than fourteen Orders in Council affecting the engineer officers. The policy of the Admiralty vacillated with the strength of the civil engineering agitation on behalf of the engineer officers. A collapse in face of that agitation would have been as detrimental to the Navy as the interference of the Parliament of Lawyers with the French Navy in the French Revolution. All denials notwithstanding, there is no doubt whatever that the Admiralty scheme is calculated to give their opponents the Pyrrhic victory of the total extinction of the old engineer officer. The standpoint of the writer's criticisms.

The unity of the Navy.

It is part of the necessary concentration required in war that the whole crew should be like Nelson's captains—"a band of brothers"—and the efficiency of the ship should never be sacrificed to the efficiency of a department. Unity is therefore desirable. The Board of Admiralty hope to bring greater unity to the profession by a common system of entry and training for the four great branches hitherto known as the Executive, Royal Marine Light Infantry, Royal Marine Artillery and Engineer branches. It will be observed that while the changes in training remove the naval instructors from afloat, the accountant branch of the Navy remains. The ultimate effect of such a change is likely to be that, if we exclude the naval chaplains, there should be only three distinct branches left, viz., the executive, the medical, and the accountant. As it is the intention to examine all lieutenants for the rank of commander in court-martial procedure and international law, and the writing of reports will be part of the examination, the supersession of the accountant branch cannot be delayed for many years.

Specialisation.

The executive branch are to specialise at some age after twenty for training in engineering as lieutenants (E), land fighting as marine officers, and the control of a ship as tactical officers. The gunnery and torpedo lieutenants will be recruited from the tactical and marine branches of the executive officers. Nearly all the misconception concerning what is to happen ten years hence, when this specialisation takes place, has been due to Lord Selborne styling the specialists, who happen for the time being to control the ship and her guns, the executive branch. Such a use of the term very naturally led to the idea that the old three branches would be ultimately re-established as separate and distinct branches. Some references to equality of treatment in promotion were unwisely made, and tended to confirm the idea that promotion would be in separate and distinct lines. It is obvious that the lieutenants generally will be, in common with the other lieutenants (E) and the marine officers, only a part of the executive branch. A new term was obviously required to designate those who from time to time direct the motions of the ship, and "tactical branch" would have served the purpose. The intention is manifest that all officers should be available for deck or engine-room duties as executive officers, but that, in their specialist capacities, they should be known by special designations, as is the case with the gunnery, torpedo, and navigating lieutenants. Hence the convenience of referring to those who, under the scheme, obtain more sea-training than the others as the "tactical branch," for it will be their distinction to have had more training in tactical work, just as gunnery lieutenants,

having had more training in gunnery work, are known by the distinctive title, although all lieutenants are more or less familiar with gunnery.

The training college.

Most of the controversy at the earliest stage of the future officer's career resolves itself round three points.

(1). It is contended that twelve to thirteen years is too young for leaving the preparatory schools. In reality, the boys will be two months younger than the nominal ages mentioned at the time of their examinations. On the other hand, the Admiralty lay down that they require four years in the training college and a minimum of two and a half years at sea, while experience shows that the rank of commissioned officer should be obtained by twenty years of age. It is impossible, they urge, to fulfil these conditions except with an age entry of twelve to thirteen years. It is the age at which many of our best admirals, including Nelson, went direct to sea. The further contention is advanced that the prolonged experience of the Navy is, that officers are best moulded in character, instinct, habits of command, and knowledge of technical detail when young.

The parallel is, however, overdrawn. Prior to Lord Goschen's changes, midshipmen of fourteen commanded men and had responsibility thrust on them, even for the lives of a boat's crew. For years and years the age of entry was never over fourteen. When the Britannia was founded in 1857, the age of entry was fixed at thirteen to fifteen, and a fifteen months' course was instituted, though capable cadets could pass out earlier. In 1859 the age was reduced to twelve to fourteen, and ten years later it was still further reduced to from twelve to thirteen years, with a two years' course and a year in a sea-going ship. That is approximately the proposal of to-day, only the school-boy stage is doubled at the expense of sea training, while the naval instructor is withdrawn from afloat.

The nomination system.

(2). Admiral Sir Vesey Hamilton contends that the nomination system should be abolished. Instead of that, we are increasing the restrictions by making the avenue of entry for every branch of the Navy a nomination system. Sir Vesey Hamilton urges that when he was at the Admiralty the nomination system was supposed to result in a system of limited competition of three candidates for each vacancy. As a matter of fact, he points out, there were only two candidates for each vacancy. In 1902 there were 640 nominations and 230 entries, but a large proportion of the nominees failed to reach the easy qualifying standard. Every department that has introduced open competition, Sir Vesey Hamilton urges, has gained by it, and it has even been introduced into many mercantile establishments. It is interesting to note that the demand for open

competition was made by Lord Goschen, as First Lord of the Admiralty, thirty years ago, when the age of entry was about thirteen years. On the other hand, the Admiralty contend that the age of entry is too young to make open competition any criterion as to whether the successful boys are likely to mature into good officers, and in conversation it is generally urged that the men prefer to follow leaders recruited from the upper classes. By entering an excess number of cadets, the Admiralty hope to be in a position to insist on the withdrawal of any who fail to attain a satisfactory standard. Sir Norman Lockyer advocates an entry into the Britannia by nomination of thirty per cent. above requirements, and then entry into the Navy by open competition among these cadets. He considers that the number would be so large that rejection would only be considered a misfortune and not a stigma, and that passing into civil life again they would, under the proposed course, "have had the best education in England, one fitting them for any walk in life." We deal with the question of accommodating so large a number of cadets in subsequent paragraphs. It is sufficient at this point to press the consideration that competition is often of a very nominal character. It is impossible to regard boys who do not even obtain qualifying marks as real competitors. Unlike Germany, the British peerage and the naval families appear to be able to hold their own without the adventitious aid of a nomination system. A recent letter in a service newspaper shows that out of a term of forty-eight boys which joined the Britannia, there are only nine left in active service. They are all captains. Four were promoted from the Royal Yacht (one of them twice), and the remaining five are near relatives of admirals or sons of peers. At least three-fourths of a term in the Britannia would belong to the middle class and have no naval connections; so that from one cause or another the naval and aristocratic strain appears in the term in question to have hopelessly distanced the others, who are completely lost to sight in retirement.

Sea training.

(3). The strongest objection urged against the scheme is, that with four years in the training college, and a minimum of two and a half years at sea before a fresh college course commences at Greenwich, sea training as midshipmen is being unduly sacrificed. The committee, which reported in 1898, mentioned three years as "the irreducible minimum" of sea training, thereby suggesting that more is really required. The drill ground of the Navy, it is urged, is being shifted by the Admiralty from the sea to the class-room. Experience, under all conditions of sea service, is the only method that can give the naval officer that character which Lord Selborne rightly insists is of more importance than knowledge. In the acquisition of know-

ledge, one half the future midshipman's time at sea will be spent in the engine-room. This necessarily involves a curtailment of the deck and boat work under the eyes of his senior officers. Unless there is a sufficiently lengthy period of sea service, the officers will lose interest in the midshipmen and cease to watch over their development, for the latter will be constantly coming and going, in addition to owing a divided allegiance to the engine room and the deck. The Admiralty contention is that the lengthy spell at the training college will include sea training in cruisers and destroyers, and that it is specially designed to complete the academic and foundational education, so that the naval instructors can be withdrawn from afloat. Their opponents retort that in the training college the cadets are school-boys, whereas afloat they are being trained to responsible command by having it thrust on them. They protest against the idea that collegiate education ceases after leaving the training college, for the boys cannot learn their seamanship, gunnery, torpedo, navigation, pilotage, and engineering at sea without imbibing a fair amount of mathematics, heat, chemistry, electricity, and mechanics. In addition, there will be lectures and the teaching of languages. The opponents of the Admiralty scheme, as it stands, point out that the best school is where theory is taught beside practice, and yet out of the first eight years of his naval career a clever boy will only spend about two and a half years in a sea-going ship; and the future engineer and marine officers, who are to be fit for deck duties, may only spend two and a half years out of their first ten years at sea. Against this the supporters of the Admiralty scheme urge the plea that we shall be no worse off as regards the tactical branch than we were under the changes introduced by Lord Goschen, and we shall be better off, as is obvious, in the engineer and marine branches. As, however, Lord Selborne in his Memorandum, acknowledges Lord Goschen's changes to have been of a retrograde nature, the plea fails altogether. The following comparison shows the sea-time obtained by a clever gunnery lieutenant during twelve and a half years' service.

AGE.	LORD GOSCHEN'S SCHEME.	THE ADMIRALTY SCHEME.
12½ to 15	2½ years at school ashore before entry into the naval training college.	2½ years in naval training establishment.
15 to 16½	1½ years in naval training establishment.	1½ years in naval training establishment.
16½ to 19½	2½ years at sea.	2½ years at sea.
	(This allows for four months sea-time—a reward for good examinations on passing out from the College, and the low estimate of only two months sick, on leave, delayed appointments, or in mail steamers on passage.)	

Age.	Lord Goschen's Scheme.	The Admiralty Scheme.
$19\frac{1}{2}$ to $20\frac{1}{2}$	1 year at Greenwich, Portsmouth, etc.	1 year at Greenwich, Portsmouth, etc.
$20\frac{1}{2}$ to 22	$1\frac{1}{2}$ years at sea as lieutenant.	$1\frac{1}{2}$ years at sea as lieutenant.
22 to 24	2 years qualifying as gunnery lieutenant.	2 years qualifying as gunnery lieutenant.
24 to 25	1 year on staff of gunnery school.	1 year on staff of gunnery school.

Modern tendencies.

It will be seen that, by the new system, out of $12\frac{1}{2}$ years only four years will be spent at sea, and in ships which it is notorious do not spend so much time under way as in former days. Of the four years only one will be in the responsible position of officer of the watch. To illustrate how, with the present tendency of the Navy to the shore, a commonplace phase of naval life can be neglected in the education of a naval officer, the following may be quoted from the signal-log of the flag-ship Empress of India on November 11, 1902:—General signal to the ships assembled: "Single-banked boats are not to sail at Portland with anyone under the rank of commander when the wind is blowing between south and west-south-west with a force of three or more." In the discussion on Mr. Thursfield's lecture at the Royal United Service Institution on the training of the Navy, a recent commander-in-chief stated that our seamen are the worst boat-sailers in the world. The above signal prohibiting the sailing of boats, even by commissioned officers in an ordinary breeze, is one of the most extraordinary signals on record; and can only mark the responsible opinion of the admiral that the officers are unable to manage the boats. A senior officer, who has never been without employment, writes to me very strongly on this subject: "A petty officer," he says, "may be put into a boat, in charge, carrying a large body of men whose lives are jeopardised by his absolute ignorance of what to do. It is constantly the case to find this. The want of judgment, which is no doubt due to want of experience and practice, is very marked. . . . I've had warrant officers tell me that they have never been in charge of a boat in their lives before—is this right? . . . I don't think there is any foreign navy that is not better than we in the handling of their boats—ours is a disgrace."

While not subscribing to all that is said, it may be urged that the initial fault lies with the inadequate sea experience of the officers as midshipmen. As officers of the watch they cannot always exercise proper supervision owing to ignorance, and the result is that single-banked boats are perhaps permitted to sail inadequately reefed, or are worked in weather when no single-banked boat ought to be afloat. The result is then a signal, such as I have quoted above, following on

a deplorable accident, which is utterly opposed to the whole spirit of the Navy; for instead of meeting a difficulty, it runs away from it, and is characterised by timidity instead of by enterprise.

It may be useful at this stage to set out the position which is to be superseded. The present position.

Branch.	Age on Entry.	Length of Course.	Numbers Entered in 1902.
	Years.	Years.	
Cadets	14½ to 15½	1½	230. (These large entries are to bring the list up, and do not represent the supply for a normal list.)
Engineer Students ..	14½ to 16½	5	40 (Larger than normal entries, in order to increase the lists.
Direct entry of Engineers for temporary service ..	20 to 23	..	16 (Larger than normal entries, in order to increase the lists.
R.M.A. Officers	16 to 18	2 years exclusive of courses in Excellent and Vernon	7.
R.M.L.I. Officers	17 to 19	..	21.

(The Marine Officers will all be on one list in future.)

There were then 314 entries altogether, and if we were to assume that such a state of affairs is to continue, there would have to be accommodation in the future training college for 1256 cadets, making no allowance for the greater wastage at the more youthful age. Adopting the 30 per cent. extra numbers advocated by Sir Norman Lockyer, there would have to be accommodation for 1630 cadets. Now, the Britannia College is being built to accommodate 260 cadets. Supposing we assume the accommodation at Dartmouth to be increased to 540 cadets, it would still only allow of an entry of 135 cadets per annum. If we assume, as we should urge, that the course should be cut down to three years, and the fourth year spent in a sea-going ship, then an entry of 180 cadets per annum could be managed.

The large increase of chief artificer-engineers and other warrant officers contemplated for the engine-room is for the purpose of replacing the watch-keeping engineer officers, so that we can reduce the entries for engineering duties to about 20 per annum. This is the number the Admiralty have decided to enter under the old system for this year, or 36 less than last year. Interchangeability in the marine officers would enable a very sensible economy in numbers to be effected, so that entries of about 20 per annum ought to suffice. For the tactical branch we have to keep up a list of about 150 lieutenants, which would absorb at least 140 entries per annum, making in all 180 entries per annum. Since, however, this is a minimum estimate, and excess entries into the training college of about 30 per The future position.

cent. might be thought desirable in order to weed out the inefficients afterwards, it might be urged that the total accommodation required will be for 650 cadets, allowing for weeding out in the first and second years' course. There are likely, therefore, always to be two rival establishments at Dartmouth and Osborne. There are advantages in this, as competition leads to efficiency, and we are not so dependent on the one establishment being crippled by outbreaks of measles, &c. The experience with the engineer branch was that the best results were achieved when rival schools existed at Portsmouth and Plymouth. The study of hydraulic machinery, electric installations, and repair work of engines is likely to take the boys away to the dockyards, and possibly some sensible economies in the accommodation which will have to be provided at the training colleges may be effected. The question has probably been faced by the present Board, for it has been too much the case in the past that the accommodation has dictated the form of training, instead of the necessary training dictating the accommodation provided, with a due regard to economy as well as efficiency. The communications which have been made public show that the Admiralty have carefully examined the present and future positions.

Chronology of the scheme.

The following chronology of the probable future working of the scheme has been compiled by the writer, and serves to show what a length of time must elapse before any of the officers entered under the new system arrive at responsible positions.

July, 1903.—First entries of new system, or Osborne cadets (12 to 13 years).

Jan., 1906.—Last entries of old system, or Britannia cadets (14½ to 15½ years).

Mar., 1907.—Last entries of engineer cadets. (If it is decided to reduce the lists of engineers, the entries may be closed earlier.) These last entries will not become available for duty until 1912, unless it is decided to shorten the present five years' college course at Keyham.

May, 1907.—Last batch of old system Britannia cadets pass into the Navy.

July, 1907.—First batch of Osborne cadets pass into the Royal Navy.

1907.—Last entries of Royal Marine Artillery officers under present system. These officers become available for duty in 1909.

June, 1909.—Last entries of Royal Marine Light Infantry officers under present system. These officers become available for duty in 1910. The present system midshipman ceases to exist.

1911.—The first batch of new system officers begin to specialise for the three branches.

1913.—Present system sub-lieutenant ceases to exist.

An intelligent study of the above chronology will show that, so far from the scheme being a sudden revolution, it is a gradual change which can be arrested, hastened, or altered at any point, though no doubt this would have to be done with due regard to the interests of parents who have prepared their sons for a naval career.

The future effects.

The chronology serves the useful purpose of showing how impossible it will be to judge the scheme by its results for many years, since none of the new entries will be afloat until 1907, or engaged in responsible duties as lieutenants until 1911. Those who take up the positions of lieutenants (E.) will not have the opportunity of proving their capacities until 1913. Much may happen during the interval. War may break out. Inventions may profoundly modify the applications of the principles of strategy and tactics. With these changes our ideas concerning the nature of the crews of the ships may have to be modified. Hence nothing can be done in the shape of grafting on to the Navy a written constitution which attempts the vain task of tying the hands of future Boards of Admiralty. For this reason I regret the unfortunate expression of opinion by Lord Selborne in his Memorandum—which would have been avoided had a Board Minute been issued—to the effect that, when the sub-lieutenants specialise in the three branches of executive (which we have termed the tactical branch), engineer, and marine officers, "it is proposed to make the division definite and final." This conclusion read so contrary to common sense, and to all the inferences from the analogy of the suppression of the separate navigating line, that it sounded very much like an anti-climax. Lord Selborne was constrained by criticism to write an explanation that "the announcement made that the division will be definite and final, can apply only to the principles by which the present Board must be guided in providing recruits for the three branches, and leaves a future Board perfectly free to relax the rule if it thinks fit." It is unfortunate, therefore, that there should have been any reference in the memorandum definitely promising to provide those who enter the engineer branch with opportunities of rising to captain (E.) and rear-admiral (E.) equal to those possessed by the tactical branch. The proposition has only to be worked out to prove its absurdity. We must have captains of ships and admirals in charge of fleets. These billets exist by force of circumstances, but there are no corresponding posts in purely engineering work except in the dockyards, and these would not give nearly enough scope for a scheme offering equal opportunities of promotion. The billets of captains of ships, &c., must be open to lieutenants (E.) or commanders (E.) on promotion even as they are to lieutenants (G.), and then they should drop their special designations. Equally unfair and wasteful would it be to hypothecate posts of admirals-superintendent to officers who have specialised in engineering. If engineering settles down into humdrum lines while gunnery is rapidly changing, it may be quite likely that for the time being the highest authorities in gunnery ought to be appointed. The

task of the historian to trace the full effect of the far-reaching changes of 1903 is one that can only be accomplished over a generation hence, when for the first time our fleets are designed, built, and handled by men who are the products of that scheme. At the present time, in all the controversy which ranges round interchangeability, we are largely dependent on analogies from the past, and our outlook is too much coloured by the wholly false perspective of the existing position and by peace requirements.

Interchangeability.

In considering the probability of the lieutenant (E.) being on precisely the same footing as the lieutenant (N.) in 1914 and subsequently, it is desirable to keep the following considerations clearly in mind:—(*a*) The present position gives us a wholly artificial standpoint to judge from, as can be seen by the utterly dissimilar training which the executive and engineer officers have undergone. The lieutenants of all descriptions will in future have the same system of entry, training, and examination up to the age of twenty. The arguments applied against any lieutenant being sent down to take charge of the engine-room, or a commander (E.) being promoted to the command of the ship, are similar in kind to those urged against executive officers doing navigating duties, or a commander (N.) being promoted to the command of a ship, as is now done. The lieutenant (N.) may never have kept a regular watch at sea, though it is only a matter of arrangement on the part of the captain to see that he does keep watch occasionally, and a similar criticism applies to the analogous case of the lieutenant (E.). In the case of the marine officers, the scheme provides for their doing more watch-keeping duties than the ordinary gunnery or torpedo lieutenants, so that there can be no argument against their promotion to the command of ships on that ground. It is the battle with ever-changing conditions which gives the sailor that adaptability and character for which he is noted, and the interchangeability from the deck to the engine-room may serve to improve him.

Interchangeability in the past.

No one quite expected that the change in the old navigating line, by which the masters were superseded by the executive naval officer, would work out in the precise way it did. The Admiralty introduced the scheme for superseding the navigating officer in defiance of the recommendations of their own nominated committee, and even to this extent the parallel to the present situation of the engineers is maintained. It is no secret that the idea of executive officers performing engineering duties was never entertained by the Admiralty engineering committee of two years ago. If, then, the parallel is to hold good all along the line, we should see lieutenants (E.) rise to the command of ships, even as we have to-day captains of battleships

who in times past were navigating officers. We should also see lieutenants of the tactical branch detailed for duty in the engine-room, as they are from time to time detailed for navigating duties to-day. In reality it is the complete success which has attended the absorption of the navigating branch that has led to the present reforms. The navigating officers, intrepid and skilful as the majority are, form the one branch from which college instruction has been most carefully excluded. If we take a lesson from this fact, we shall not repeat the mistake of the five years or more of college course in which the present engineer students are trained. It is not too late to alter the course, which is the longest for naval engineers of any nation in the world. This question, however, will probably solve itself as we learn the value of understudying in practical work at sea. We might also find that the evolution of the change will prove, as was the case with the navigating line, that safeguards thought necessary in introducing the change became wholly without *raison d'être* when the time arrived for which they were provided.

The navigating branch.

We can now, after thirty years, watch the full effect of the changes under which the old navigating branch passed away. As Admiral Montagu explained in the *Times*, "he could recollect how, for some time after he joined the Navy, it was only thought possible that the master and master's assistant could navigate the ship; no one else troubled to learn navigation, and not one captain in twenty had a sextant or understood charts and pilotage." Now the position is that if the lieutenant (N.) falls ill, it is merely a matter of telling off another lieutenant to do his duties. All the prognostications of failure as regards the change of navigating officers were signally falsified, as in time they are likely to be, in the very hasty amalgamation affected in the United States Navy between the engineer and executive officers three years ago. In the United States Navy it was decided to make all the existing engineer officers into line officers. A mere change of label without preliminary training was bound to meet with great difficulties when strange duties came to be performed, so that time was required to bridge over these difficulties. The failure in the United States Navy has not been the amalgamation, but the lack of foresight of Congress in neglecting to provide the necessary number of officers. It is important to insist on this point, for there is a good deal of misconception in England about the matter.

The engine-room staff.

The parallel we have drawn of sending a lieutenant to take charge of the engine-room suggests rather an easier task than that of navigating, since the work of maintaining engines is largely routine work, and the Admiralty contemplate increasing the skill of the staff

very considerably by improvements in the positions of the artificers. The lieutenant of to-day has to be a mechanical engineer, and that is the type required in the engine-room. The much more difficult task of a designing engineer is one that does not enter into ship life.

The engineer warrant-officers are to be increased gradually to over 800. The change is illustrated by the fact that this warrant officer class was only created in 1897, and on January 1, 1902, there were only 133 artificer-engineers. In the engine-room-artificer grade there were 1596 on January 1, 1894, and 3322 on January 1, 1902, so that in eight years the number had more than doubled. These men are the backbone of the mechanical engineering profession afloat, and every endeavour should be made by improving their position to secure the best men. The Admiralty propose to train 50 per cent. of the entries into this class as boys entered at between fifteen and sixteen years of age for five years' training. It is difficult to see what justification there is for this step. If it costs the country £291 to train up a seaman-gunner, it will cost much more to train up an engine-room artificer. The Admiralty would be better advised if they improved the position of the artificers, so as to tempt the best mechanical engineers into the Navy, instead of complicating matters and fomenting lower-deck jealousies by two radically different systems of entry for the same branch.

The evolution of the *personnel*.

The historian has the happy position of a general working on a *tabula rasa*, where there are no limitations of vision, the forces being clearly seen, and the problem resolves itself into certainties rather than doubts. If, however, the Admiralty would adopt the historical method, and search back in the past, they too would discover the tendencies which have brought us to our present position. These tendencies never cease or commence abruptly, but proceed evenly, changing gradually under the influence of new compelling forces, which are equally discernible. To study the tendencies of the past is the only way to dissipate the fog of the present. In 1830 the Lords of the Admiralty "felt it their bounden duty to discourage the introduction of steam, as calculated to strike a fatal blow to the naval supremacy of the Empire," although at that time our coal and iron productions probably exceeded those of the whole world, and were rapidly increasing. If the Royal Commission of 1859 on the Manning of the Navy had adopted the historical method, they would not have made such a ludicrous forecast as to say that future wars would still be fought under masts and sails. If even such a simple example of a tendency as a graphical curve of Great Britain's coal production up to 1859 had been before them, they would not have given as a reason for their forecast the

equally astounding one that the coal production of the world would not furnish enough coal for naval requirements.

The warship's internal organisation.

The conditions which had preceded the introduction of the Admiralty scheme can be very plainly traced. For over half a century an engineering branch had been part of the *personnel* of all navies, and for over twenty years the battleships had been without the auxiliary power of masts and sails. With increasing speeds, greater complements were demanded for the engine-room. At the same time growth of secondary armaments and the increased rapidity of fire of modern guns absorbed more and more men for the ammunition supply. We had reached a position in which it was impossible to give either branch the necessary complements, and therefore one had to merge into the other. If the engines were running at over three-fifths power, deck hands had to be sent down to assist, and it was felt necessary to give the stokers a certain amount of gunnery training. The following table shows the relative growth of the different branches. By it we can see that the engine-room branch, from being one-third, grew to four-thirds of the marine branch, and from being one-sixth, grew to three-sixths of the executive branch. In addition, it should be remembered that the increase of the engineering branch has been a great deal more rapid in the last twelve years than in the previous thirty.

Year.	Executive Branch.	Engine-room Branch.	Marines.	Other Branches.
1868	31,981	5,391	15,970	11,052
1878	27,911	5,627	13,727	8,508
1888	28,232	8,536	12,847	8,914
1898	44,336	22,289	17,099	11,816
1900	49,222	25,959	18,461	12,865

The necessity of changes.

It was evident when the Hyacinth this year, at the Belleville boiler trials, with an excess complement in the engine-room, had to reinforce her staff by eighty deck hands, that the system of organising the crew in "water-tight compartments" was breaking down. Before any real change could be brought about affecting the men, it might be contended that a merging process would have to be resorted to among the officers of the different branches, of which the most wholesome result should be to teach them to enter sympathetically into each other's difficulties. In reality, the difficulty of finding room for all the necessary officers, without impairing the ventilation by an excessive number of cabins, was no less urgent than in the case of the crew. The reason that the

necessity of more officers is less in evidence to-day is that in peace we work on routine lines which are very different from the terrible strain thrown on the officers by a modern war. Glancing back fifty years, we find that the Mediterranean flagship of that day accommodated more officers and men than the flagship of to-day, and could rely on nearly the whole of them for combatant duties. Instead of a number of isolated positions requiring separate control, the Marlborough had open batteries, easily controlled by one officer, for the whole length of the deck, and the large port-holes gave efficient ventilation to the ship, so that the question of cabins did not arise. She had no reserve craft or auxiliaries to provide officers for. The strain of high speeds, and the torpedo menace at night were altogether absent. Yet it is a fact that she carried a far greater proportion of executive officers. Quick-firing guns have made it fairly certain that there will be large casualties among the officers working above the water-line to-day. There seems to be no escape from the conclusion that the officers below must be trained so that they can take the places of those on deck. It is a most shocking waste of public funds to have brought into the Navy as commissioned officers 930 engineers and 470 marine officers, who can give no effective aid in the task of directing the movements of the ship, and have acquired no knowledge of the sea whatever or of the control of men until nearly twenty years of age. The marine officer, not being an executive officer, and in spite of his special military training, was even so far wasted as not to take charge of the entire landing party when a naval brigade was landed. It may be expected in the future that the lieutenant (M) will perform this duty and instruct the crew in anything appertaining to landing parties.

The scheme's great merit.

Whatever may be said against any attempt to make an officer a jack-of-all-trades, this much is certain: The young officer of twenty who entered the Navy as a marine officer or engineer under the old rules would, in the year 1910, be merely a raw school-boy with no knowledge of the sea. Under the new scheme he will be a man who has been trained to a certain extent in a seafaring life, capable of reinforcing the directing power at any part of the ship. After all, the end and aim of a battleship or cruiser in war is to keep the sea as an effective fighting unit, and towards this ideal the marine officer, under the old system, practically contributed nothing. On the other hand, the engineer branch could afford no relief to the executive branch, or *vice versa*. In the Far East we have an example of the new system working in the American squadron where the most important ships under Admiral Evans' command have former deck officers in charge of the engine-room, and they do their duties to

his enthusiastic satisfaction, as British officers on the spot have found out.

Mechanical training.

It is another merit of the scheme that it brings the naval officer into harmony with the mechanical tendencies of the day. Ships have been built for the Navy with from 70 to 90 separate engines, while electric motors are gradually being introduced to accelerate the ammunition supply of the secondary armaments. The officers in charge of guns will require mechanical knowledge, for they cannot send for the engineer in the middle of an action. In both the realistic firings of the Majestic and Royal Sovereign it was found that messenger work was impracticable, and that the officers in charge at each fighting position would have to depend on their ready wits to meet emergencies. If this was the case in firing at a passive target, how much more so must it be the case in an engagement with an active enemy. To meet the emergencies of damage in action mechanical training is an essential. In the words of President Roosevelt, "every officer on board a modern war vessel in reality has to be an engineer whether he wants to or not. Everything on board such a vessel goes by machinery, and every officer, whether dealing with the turrets or the engine-room, has to do engineer's work."

Mechanical progress.

The fact that about sixty per cent. of the crew and most of the combatant officers were so ignorant of machinery has had a most unfortunate influence in limiting the introduction of labour-saving devices, and has probably reacted on the dockyards in keeping them behind private enterprise in this respect. Labour-saving devices on board ship are most desirable, for, as we have seen, the demands made for purposes of fast steaming and rapid ammunition supply required crews beyond the accommodation of the ships, and therefore pointed strongly to the introduction of devices to reduce manual labour. In addition, the work of war, throwing great strains on the physical capacities of officers and men, made it very desirable to economise labour in other directions so that the crews could be kept as fresh as possible. An army can take its repose while a fraction of the force does outpost duty. The same cannot be said of a navy, and we ought to think out during peace how to lighten the burden as far as possible. It is a significant fact that the United States Navy has gone furthest in mechanical training, and has also done most in adopting labour-saving devices, such as that by which one officer can close all the water-tight doors of the ship from the conning tower.

Foreign systems.

It is of some interest to note the various systems under which the six great maritime Powers enter and train their officers, though with our large Navy we must always be beforehand in the inception of reforms.

In all cases the age of entry is over thirteen years, which is

the minimum age selected by the headmasters in their recent conference in London. The probability is that the foreign officers

Country.	Age of Entry into Training Establishments.		Length of Time spent under Training.			
			Ashore.		Afloat.	
	Executive.	Engineers.	Executive.	Engineers.	Executive.	Engineers.
France	15–18	17–20	2	1½	1	3
Germany . . .	not laid down	21	1½	2¼	2	6¾
The United States	15–20	15–20	4	4	2	2
Russia	13–15	17–18	4	2¾	2	1¼
Japan	17–20	16–20	3	3⅓	1	⅔
Italy	19	15–17	2	4	2	Nil.

enter upon their naval training somewhat better equipped from the purely scholastic point of view, but it is doubtful if they stand in so good a position in acquiring the necessary familiarity with a modern seaman's work as would have been the case under an earlier age of entry. There is probably no more telling piece of unconscious criticism in history than the surprise of Chateaubriand, writing in 1800, at the successes of the British Navy, for the French officers were, he stated, better educated than the British, who "knew only their seamanship." Suffren was perhaps the only French sailor who scored real successes against Great Britain, and he spent his naval career almost wholly at sea. It may be said that modern mechanism has created a need for a much larger measure of scholastic instruction. The need is more apparent than real. The old sailors were trained up in facing the practical conditions of their craft, and the analogy as regards mechanism is to place those who would become intimate with it in the midst of mechanism itself. On grounds of economy, it may suit some European Powers, to use the language of M. Pelletan, "to cease from wasting coal through the funnel." The workshops of the country are then the next best resource; and to the full use which the United States Navy made of this method is to be attributed the mechanical ingenuity of the American officers.

The United States.

The fact that the United States Navy is ahead of other Navies in mechanical knowledge was accounted for by Rear-Admiral Bradford, the Chief of the Bureau of Equipment, to a representative of the *Army and Navy Journal*, in the following words:—

"The line officers of the United States Navy are, generally speaking, much better informed in all that pertains to mechanical, electrical, and steam engineering than the officers of any other

Navy of the world. This is partially due to accident. When the Navy of the United States reached its lowest point of efficiency, about 30 years ago, and was without any formidable ships, even possessing very few ships of any kind, the Navy Department desiring to at least maintain a corps of officers, cast about for shore work for them to do. Sea-going officers were detailed as inspectors in many industrial establishments of the country; schools were established for the instruction of officers in electricity, chemistry, metallurgy, torpedoes, and other important branches of their profession, and officers were granted leave in order to accept service with manufacturers of armour plate, guns, gun mounts, and other munitions of war. The consequence was that when the construction of the new Navy commenced a corps of specialists had been established, and many officers had become familiar with the complicated mechanisms in use on shipboard. This duty has largely been maintained up to the present time. In addition, the course of instruction at the Naval Academy has included engineering branches, and young line officers have been required to serve in the engine-rooms of cruising-ships."

Entering the Navy from the same training establishment, in which three out of a four years' course was identical, an amalgamation of the executive and engineer officers of the United States Navy was not nearly so stupendous a task as has to be overcome in the much larger British Navy. It is significant of the tendencies of the times that Admiral de Beaumont, a distinguished French naval officer, has written an article, which appeared in the *Marine Française*, in January, 1902, favouring an amalgamation of executive and engineer officers in the French Navy.

History and strategy.

The chief danger is the undoubted fact that the work of a mechanical engineer afloat is so largely a matter of routine methods and of small details that, if the mind is long engaged in this direction, a narrowing influence will be exerted. For this, if for no other reason, the Admiralty are deserving of all praise in their determination to enlarge the outlook of naval officers by insisting on a qualifying knowledge of history, strategy, tactics, and international law, in passing for the rank of commander. There have been so many cases of naval officers of high rank enunciating opinions which conspicuously lack all sense of proportion, that the suspicion seems to be well-founded that many officers do not study the larger questions of their profession and its position in regard to the taxpayer until they reach high rank or relatively late in life. Qualifying examinations, free from the pedantry of marks and class certificates, by fostering discussion and study, may do much to mitigate this evil.

Changes affecting the men.

The chief change amongst the men under the new scheme is the decision to enter one thousand seamen and stokers for short service with the remainder of their twelve years in the reserve. It is something achieved in the direction of economy to have the principle recognised that we must endeavour to increase our *personnel* by swelling the reserve. It is impossible for the country to go on increasing the *personnel* by 4000 to 5000 annually. It is not necessary. Only a small proportion of the crew are worth retaining in the service at all hazards, because of the excellence of their gunnery or other reasons. Several other countries have the advantage of Great Britain in reserves without possessing nearly such great natural advantages as the latter for their formation. The reason is to be sought in the fact that in the British Navy the length of service exceeds that of other countries by five to nine years. As compared with our twelve years, the longest service is the five to seven years in the Russian Navy, with eight to ten years in the reserve. It should, however, in fairness be added that in the Russian Navy the recruits enter at twenty-one years of age, whereas we enter them as boys. While youthful training may be desirable, the existing system is excessively costly.

The cost of training seamen.

Apart from the signalling staff and a certain number of petty officers, the only seamen of real importance are the seamen-gunners. Mr. Arnold-Forster officially stated last year that it costs the country £291 to train a seaman-gunner from the time he enters a stationary training-ship, or £261 from the time he enters a sea-going training-ship. The cost of training a boy for sixteen months in the stationary training-ships is £153, apart from expenditure on the maintenance of hospitals and other buildings on shore. If it could be shown that any intelligent selection of seamen, according to their capacities, took place while in the training service, we should not grudge the heavy price. But, at the same time, we are entering 20 per cent. of the boys in sea-going training-ships at £10 per head less in annual cost and training them in six months instead of sixteen. This naturally induces a close inquiry into the shore-training system. Under it we find that only 3 per cent. of the training-ship regulations of last year were devoted to gunnery, and, though over 6000 boys were under training, there was no gunnery lieutenant to look after their shooting qualifications. The boys did some rifle firing, but that is a practice unknown to modern naval war. Each boy fired three rounds from a muzzle-loading gun. There was no machinery for ascertaining the best shots, and the boys left without any training in Captain Scott's dotter or deflection teachers, which allow of a good grounding in shooting without any expenditure of ammunition. Nothing whatever appeared on their certificates as to their marksmanship.

Mechanical training of men.

The necessity for imparting some knowledge of stoking and mechanical craft to the boys in the training ships is seen when we recognise that, with the engines working over three-fifths power, the deck hands must reinforce the stokehold. The Admiralty have now decided to arrange for this training. It is to be hoped that the training will not be conducted in the same inept way as gunnery has been, and that no time will be wasted in giving special training to those who display no aptitude for mechanical work; for such there is always room on board ship in the ammunition supply, etc., and then, after a brief naval career, they can join the reserves. The vastness of the whole question can be seen when it is stated that we have nearly 10,000 boys in the Navy, of whom 4000 entered in 1902 through the stationary ships, and 1050 through the sea-going ships. The Navy Estimates 1902–3 allowed for 6200 under training. The remainder were distributed as follows:—

Ships in commission	2693
Coast Guard ships	340
Depôts, stationary and instructional ships . .	622
Surveying ships	45

Over a thousand were, therefore, distributed, after a very costly training, in ships where they could learn but little of their profession, and where they probably performed duties of a less responsible nature than those of a district messenger boy.

Conclusion.

When all is said and done, it must be conceded that systems, and the Admiralty scheme amongst them, must depend on far higher things. If the Lords of the Admiralty, the responsible admirals and captains, are badly chosen, the most skilfully contrived scheme will be of no avail. In the initiative of the Board of Admiralty and the admirals must remain all that draws out or atrophies the ability of the officers and, therefore, of the men. Much, therefore, will depend on what action is taken by the Admiralty with reference to the report of Lord Goschen's committee on promotion. By the War Course at Greenwich and the Intelligence Department it is possible for the Admiralty to widen that stream of information which is the raw material of discussion, and therefore of progress. They must aim, as Moltke did with his General Staff, at broadening the minds of the officers so as to look beyond the immediate surroundings, and so reinforcing their counsels by the intelligence they have cultivated amongst the officers afloat.

CARLYON BELLAIRS.

CHAPTER X.

The New Admiralty Education Scheme.

Evolution and revolution.

The Editor of the *Naval Annual* having considered that both sides of the important question of the new scheme should be given in it, and knowing my views are adverse to the scheme, asked me to give them to that very useful publication. I regret he could not have given me more time for the expression of opinion on a subject that requires very much consideration, being so full of detail and so revolutionary.

I have always understood that statesmen were averse to revolution, preferring the slower but surer road of reformation. It cannot be denied that this scheme is revolutionary, by far the most revolutionary ever thrust on the Naval Service, which hitherto has been built up inductively, "line upon line, precept upon precept," with, I have no hesitation, in adding, the most satisfactory results, particularly when it is considered how much the Navy had been neglected for many years. I will give an extract from Oppenheim's edition of "Monson's Naval Tracts," vol. 2, p. 201, on that subject—contrasting naval with military service. He observes of the military officer:—"He had nothing of the ceaseless permeation with his work, which made the seaman; nothing of the tireless watch and combat with the elements which trains natural powers to their highest range. Thus the Army became associated with fashion and the graces of society, the Navy with the harder virtues of the constant fighter." (In supplying the Navy with ordnance stores in military charge, when Director of Naval Ordnance, my colleagues of the other service assured me the Navy always came first, as it was considered by them as being always at war. I did not, however, always find facts in accord with the theory.) . . . "For the naval officer the sea was becoming, and continued, the business of his life, . . . for the naval officer technical knowledge was the indispensable condition of success in his struggle with nature, and his daily life kept him expert even in spite of himself. A natural selection increased the divergence (from the Army), for unless influence can promote him rapidly there is no room in the Navy for a blunderer or a shirker, and it was soon recognised that, though

suitable for younger sons, it was no place for the fool of the family." He then shows the Navy had no Court influence after the latter part of the seventeenth century. William of Orange was military, as were Georges I. and II. "ignorant and military in their inclination. Discouraging as this may have been to the individual, it was of advantage to the Navy as a whole, for, thrown back on itself, taught to rely on its merits, and looking to duty rather than to favour as the road to worldly success or personal content, it grew into a virility it never would have obtained under the shadow of a Court." The old plan by induction being too slow for the rising generation the present revolutionary scheme was evolved. It is a curious commentary on it that there had been no general demand for naval reform, let alone revolution, on the part of the country, such as is the case with the Army, which is being reformed, not revolutionised. The results of the changes cannot be foreseen, for it will be ten years before they are realised. It takes a prophet to look so far ahead, and one of the curious points about this scheme is that while its adherents are sanguine as to its success they are much annoyed at those who differ from them in opinion. One writer in the Press remarks: "As to prophets it is no use arguing with them; the only plan is to ignore them," apparently forgetting that they themselves are prophets with regard to its success. One of them looks twenty years ahead to our future Nelson, if ever we have another under the system, "as coming from the engine-room."

Mr. Childers' scheme.

I remember too well the flourish of trumpets with which Mr. Childers' scheme was brought in, how soon the pruning knife was brought to bear on it by succeeding Admiralties, and how signally its calculations as to economy were falsified, as they generally are if people will only take the trouble to compare results with schemes. Instead of greater efficiency there was less, and promotion soon became slower. Under Mr. Childers' scheme two rear-admirals, one of whom is now alive, were to have held that rank only two years, though they really held it over five. The scheme gave more employment by a reduction of the number of officers from which the Navy has never recovered. An admiral on the active list, of recent very good service, writing to me hopes future Admiralties will so modify the scheme as to extract the sting. Another one regrets it, as the Navy has adapted itself to the times whenever it could obtain Treasury sanction; but it could no more than the children of Israel make bricks without straw. However, since the Naval Defence Act, and the greater interest taken in the Navy by the country, it has gone ahead. From several sources I glean there is a very strong feeling that the next great political pressure

brought to bear on the Admiralty will be on the part of the engine-room artificers, as most certainly will be the case if they find themselves masters of the situation in the engine-room in practical knowledge. Speaking personally, I most sincerely hope that the parents of this scheme will realise their expectation, for otherwise its effects will be most disastrous to the Navy, and consequently to the country. But I ask, is there any person so far-sighted as to give a positive assurance as to its success? If it is a failure—and no one can politically look ten years ahead—God help the Admiralty and Navy then employed. The authors of the scheme will then be dead, or officially so, and the sins of the parents will be visited on the children, and we may be caught "swapping horses when crossing a stream."

Fallacious judgments.

This scheme was published on Christmas Day, 1902, and a day or two afterwards we were assured it was almost universally approved by country and Press. Probably some, if not all, the newspapers had been supplied with advance copies, or ready cut-and-dried articles could not have been immediately issued to influence the public. The leader writers could not have anticipated so revolutionary a scheme. It occupied nearly five columns of the *Times* in its smallest print, and it is so full of small details that it could not have been read, learnt, marked, and inwardly digested in so short a space of time by anyone who had not the literary digestion of an ostrich. The value of opinions so hastily formed concerning a revolutionary scheme, for which there had been no previous demand, may be illustrated by Lord Rosebery's speech at a large public meeting, where he eulogised it warmly, although he acknowledged: "I am wholly incompetent, being no expert, to judge that memorandum." I cannot but conclude there are many of the approvers in the same category. Another of his lordship's reasons for approval was that Lord Selborne had thrown over "red tape," which one would hardly have expected from an ex-Prime Minister. Red tape is indispensable, but, like every other good thing, may be abused; the result in this case has to be proved.

Specialism.

This is peculiarly an age of specialists, in the Navy as in other professions. The medical supplies numerous instances such as aurists, oculists, dentists, and others. The law supplies similar instances. Such high disputes "run betwixt tweedledum and tweedledee" in the Church that the same may be said of the clergy. There are civil engineers and mechanical engineers, with subdivisions, and so on almost *ad infinitum* in every branch of science, and yet in this scheme it is proposed to educate the special and diverse portions of the Naval service, viz., the executive, the engineers, and marine

officers, on one system for seven years. After some years they are to be selected for their speciality, and their education is then to commence. There is no precedent for such a scheme. It has been tried, as far as the engineers and executive are concerned, in the United States Navy, and been condemned even, if I am not mistaken, by Rear-Admiral Melville, the talented chief engineer of that Navy, and the parent of the plan. In anything relating to profit our great steamship companies are in advance of the Navy. They choose the captains and officers of their magnificent liners from boys educated in the Conway and Worcester, with admirable results, if I may judge from the midshipmen we have had in the Navy from those ships. For their engineers they go to the great engineering establishments, with equally good results. They do not attempt to manufacture "jacks-of-all-trades and masters of none," or "admirable Crichtons," and if any one firm was bold enough to attempt to do so a falling off in passengers and dividends would soon follow. Certain authors, "whose little knowledge is a dangerous thing," have lately taken to run down the Navy as not up to date, and judging from late correspondence in the Press it would appear they have drawn their inspiration from the Mediterranean. It may be said of every public department, and I suspect of most private establishments, that their systems can be improved—by reforms, not by revolutions.

Experienced opinion.

I give an extract from a letter I have just received, since writing the above, from a very competent authority on naval matters (not a sailor) from abroad. He writes:—"Social influence has played the very deuce with the Army . . . I earnestly trust that the Navy will never come under the same influence, but I think there is reason for anxiety on this score. I feel the very strongest objection to the new entry rules, and I am discouraged to find there has been so little criticism in England. They will, I believe, inflict infinite harm on the Navy, and they show on the part of the Admiralty a clear concession to popular clamour, which is a bad sign. I quite feel that something might have been done to meet the more reasonable claim of the engineers, but the plan of casting all officers in one mould is quite wrong, and must fail. It has certainly not answered in the United States. The executive naval officer has an immense amount to learn already; the idea of making him a naval engineer in addition is futile. Every naval engineer, to be fit for his profession, ought to spend three years at the bench and in the workshop. How can you pass all officers through this mill? It should clearly be done before the age of seventeen; afterwards it is too late for this apprenticeship. It seems to me that you will certainly get a class of naval engineers who have not got enough practical knowledge of their profession to

take off their coats and make "a packing" as they ought to do, at least, in the junior ranks. If so, the power will fall into the hands of the artificer class, and after a little time they will say they are the real naval engineers, and start an agitation which will be backed by the civilian engineers. . . . Our present system has not failed, it has given us excellent officers of a fine type. It has also given us many capable engineers, why start what is in effect a veritable revolution? . . . It ought to have been pointed out that the whole tendency of civil life is against mixing up distinct expert functions in one person. . . . The new scheme violates principles which are becoming more and more recognised in civil professions." This letter was received by me on March 25, several weeks after it was written, and after most of this article was written; it is to me, however, a very strong confirmation of views I had expressed before it was received, as most of this article was written in sections at different times. It confirms my own opinion that it is futile to expect to cram a quart of knowledge into a pint pot.

"Officers only required to be seamen."

In the memorandum it is stated: "In the old days it sufficed if a naval officer were a seaman." Where that idea originated it is difficult to conceive, not from a study of naval history, for there was no conjoint naval and military operation in which the sailor, after landing the troops, did not play an important part on shore. At the siege of Martinique, in 1762 (see Mundy's "Life of Rodney"), the Naval Brigade is reported as having "been of inestimable service" in getting guns into position, almost as inaccessible as some of those in South Africa our Naval Brigade succeeded in doing; also at the siege of Havannah under Keppel, and at Manilla in the seven years' war (1756–63). At Martinique again, 1795, under Sir John Jervis (afterwards Lord St. Vincent) and Sir Charles Grey (afterwards Lord Grey). Harris Nicolas's letters and despatches of Nelson contradict the statement. Bastia in Corsica was taken by the Navy, against the opinion of General Dundas, commanding the Army, who, when asked by the Viceroy of Corsica and Admiral Lord Hood, who commanded the Navy, to assist, refused, saying he was a better judge of what could be done against forts than they were, as he ought to have been. But the fall of Bastia proved him wrong; it was in sight of the army tardily marching towards it when the surrender occurred to the Navy.

Services of naval officers on shore.

The classic letters of Collingwood and his extensive correspondence with almost every potentate in the Mediterranean, Christian and Mahomedan, whose very names are unfamiliar to a good many educated people, prove to the contrary, as does his prophecy in 1808 that Napoleon "was then at the zenith of his power, and his fall would be as rapid as his rise." The siege of St.

Sebastian by Wellington would have had to be raised but for seamen manning his guns ashore; as he lacked artillerymen, the seamen also took a distinguished part in the assault. Lord Raglan would have had to raise the siege of Sebastopol for the same reason if the seamen had been withdrawn, as the Admiralty and the admiral wished. Peel's Brigade in the Indian Mutiny, where Lord Clyde wrote, "here was seen the extraordinary sight of 32-pounders in front with the skirmishers," is another signal disproof of the assertion.

It is a curious fact in Lord Wolseley's career that wherever he has seen fighting service there has been a Naval Brigade—Burmah, Crimea, Indian Mutiny, China, Coomassie, Tel-el-Kebir, and in all his Egyptian work. Admiral of the Fleet Sir Noel Salmon got his Victoria Cross almost alongside Roberts and Wolseley at Lucknow. The first Lord Lyons was a very able diplomatist, as well as being the ablest admiral in the Crimea or afloat. Lord De Saumarez—who was Commander-in-Chief in the Baltic 1808–13—although we had declared war against Sweden, and theoretically we remained at war for two years, by his politic and generous conduct he succeeded in averting hostilities, and this fact was recognised by the Crown Prince of Sweden (Bernadotte), who presented him with a sword worth £2000. The minister, Baron Platen, wrote: "You have been the guardian angel of my country; by your wise, temperate, and loyal conduct, you have been the first cause of the plans that have been formed against the demon of the Continent. . . . You were the first cause that Russia dared to make war against France. Had you fired one shot when we declared war against England, all had been ended, and Europe would have been enslaved."

In the despatches at the Record Office of the commodores on the coast of North America from 1765 to the outbreak of the Revolution will be found as clear and statesmanlike views of what was coming as were contained in Colonel Stoffel's letters to the French government on the Prussian preparation prior to 1870, probably with the same result—"pigeon-holing."

The expedition to Benin, two hundred miles inland, was most successfully carried out under Rear-Admiral Sir Harry Rawson. Were he and his staff, who had prepared for every contingency, mere sailors? It was most certainly not naval work. It is a mystery to me why the Navy had to do it; but it cost very much less than any military Coomassie expedition.

Officers as administrators.

It is very fortunate for this country that its admirals have not been mere sailors. They have frequently carried delicate negotiations to a successful issue, and at one time or another have co-operated with or assisted every department of the State. But the Navy has

received very little assistance from any, not from want of will, but from its not being required.

There has been no exhibition more successful than the Naval Exhibition at Chelsea Hospital, conducted by naval officers, aided by some eminent civilians, whom they sensibly were glad to obtain, by their diplomacy, for work they could better do than the Navy. A German admiral, sent by the German Emperor to report on the Naval Exhibition of 1890, wrote: "In these galleries they have the history of the British Navy from its earliest periods. That history is an almost complete series of triumphs, and no other nation in the world can show such a thing." And yet in the new scheme we are told the old British naval officer was only a seaman!

Perhaps the most important reform ever carried out for the benefit of this country was the cleansing of the Augean stables of Admiralty corruption by Admiral Lord St. Vincent, when First Lord of the Admiralty, who was opposed by every member of the Cabinet except Lord Eldon. The amounts swindled by corrupt officials and corrupt contractors amounted to millions of pounds; at the same time our sailors were supplied with wretched food, and Nelson's "weather-beaten ships off Toulon" were supplied with rotten canvas and bad ropes. But no statesman had ever dared to grapple with this mass of corruption, although well aware of it. The seaman did so and succeeded. These instances might be multiplied to any amount, proving the truth of Admiral Colomb's remark—the statesman is often found on the quarter-deck and not at the desk. That naval officers were only seamen was a very ill-advised remark, tending to mislead the public, and is not founded on fact, and consequently is "one of those things best left unsaid." The Navy has only lost one battle, that off Beachy Head on June 30, 1690, and that was an indecisive victory for the French, followed by no results. Rodney's victory of April 12, 1782, enabled us to make an honourable peace instead of a dishonourable one. And it was the naval command of the sea in Indian waters that enabled soldiers and statesmen to add an Empire to the Kingdom of Great Britain and Ireland. It has in every war, except the revolutionary war 1776–84 with the now United States, France, Holland and Spain, and the anything but benevolent armed neutrality of Russia and the Scandinavian Powers, always stood between our foes and their threatened invasions, and but for the Navy Wellington would never have been a duke. And last, but not least, in every war since 1700, our Navy has so effectually protected commerce that, excepting the revolutionary war 1776–84, it has increased in war, and in that war, brought about by the blunders of statesmen, and carried on also in the same manner, commerce was saved from

great disaster by the Navy. In that war commerce "decreased 27 per cent.," and "the neutral flag was never so numerous in English ports." In the previous war, the Seven Years' War, it increased by 30 per cent., and the grateful citizens of London recorded of Pitt—he was the only minister who had ever made war and commerce flourish together.

Historical lessons.

At the present moment a British naval officer is Chichele professor of history at Oxford, and another is professor of history at the King's College, London University, while a good many naval officers hold prominent positions in our large manufacturing establishments. I doubt if even Dickens' or Scott's novels are as popular as Captain Marryat's. There certainly never was a period when a competent Defence Committee was more required than at present, when our War Minister declares he has no confidence in the Navy, forgetting, as the late Sir John Seely told us, "in reading the past history of our country we are reading its future," or words to that effect. Captain Mahan proved to historians that had Carthage commanded the sea instead of Rome, the fate of the world would have been different.

The decoy theory of our fleets has certainly decoyed Mr. Brodrick into a trap. History records a freedom from real invasion, as Alison observes, for 500 years owing to the Navy. Fox, the great statesman, in 1795 in Parliament, complaining of the small results from war-like operations, observes:—"The sooner it was remedied the better at this critical period, which required uncommon exertions of skill and valour in every department, but particularly the Navy, on which the safety and glory of the Empire so visibly depended, and on which every judicious man placed more reliance against an invasion than on its land forces." Raleigh, whose competence no one can deny, observes:—"Whether England without the help of her Fleet be able to debar an enemy from landing, I hold it is unable to do so, and therefore most dangerous to make the adventure. For the encouragement of a first victory to the enemy, the discouragement of being beaten to the invaded may draw after it most perilous consequences." The country will not be satisfied with vague statements from Mr. Brodrick that he is not satisfied unless he can bring historical proof of naval failures, and prevention of invasion is better than its cure.

Deputation to the First Lord.

Not long ago I read the Blue Book containing an account of an interview in July, 1901, between a deputation consisting of five Members of Parliament and two presidents of engineering associations and the First Lord of the Admiralty and other members of the Board, and I unhesitatingly assert that not one of the deputation had the slightest knowledge of the internal organization of a modern man-of-war, except from hearsay, from what may be called the

"adulamites" * of the naval engineers, and the First Lord was told he "*must* not be too inquisitive in asking for their names." Being a political organization the views of the members representing these anonymous gentlemen were most attentively listened to—the fear of loss of votes has a wonderfully stimulating effect on politicians. From the deputation it might have been supposed the engineers were the only indispensable body on board a man-of-war. Every one on board is necessary in his own sphere. Now a modern ironclad and our huge mercantile liners are models of skill and science on the part of our eminent naval architects and of the leading civil engineering firms of the country. They may have all their working engineers appointed, but it appears to be quite overlooked that when in every other respect perfectly ready for sea the ship is "as idle as a painted ship upon a painted ocean," and unable to perform any of the functions for which so much money has been spent, until that very important, but overlooked, class, an executive, is appointed to carry out the important work the ship is designed for. There never was a period in the history of the Navy when greater skill, nerve, judgment, and the rare gift of intuitive power of instant decision were so much required as they now are by our captains and officers of the deck watch who may be in charge of the ship, manœuvring in fleets in foul weather, or in fogs by day and night, in close order—for open order is now almost unknown—not only looking out for your own ship, but to be ready promptly to meet contingencies arising from errors of judgment of your neighbours, also the perils of navigation, entering harbours at night or in thick fogs. On their skill and judgment depend the safe conduct of over a million's worth of property and the lives of all on board.

The duties of engineers.

The engineer has no such responsibility as the executive; such powers of intuitive decision are rarely, if ever, required. As far as nerve trial goes his post is an easy one; he is never in darkness, fogs or thick weather; never has rain, snow, sleet or hail beating in his face; his duty is to obey promptly the orders he may receive from the bridge. One great grievance of engineers, as expressed by the deputation, was that they were not executive officers. Probably the members of the deputation were quite ignorant of the meaning of the word "executive." It was in use long before an engine was thought of for a ship, and is no sign of any superiority beyond its being meant to distinguish those officers who, in the event of the captain being disabled, or any of the superior officers, are authorised to assume the command of the ship. The term non-

* Not even Sir John Colomb—who may be considered as the restorer of our naval strategy, forgotten for many years—had ever served in an ironclad.

executive is applied to officers who are not qualified to take the command under any contingency, and in no way implies any inferiority in relative rank or position.

The Mercantile Marine.

A few months ago two merchant steamers came into collision and one sank in forty minutes after it. Being early in the morning many were asleep at the time, but the whole of the passengers and crew, 140 in number, were safely conveyed in nine of the boats of the sinking vessel to the other vessel, one boat being swamped lowering. To whom do the rescued passengers and crew owe their lives? Not to the engineer, who, of course, did his duty bravely, and stuck to his engines till the fires were put out, but was then at liberty to look out for himself. The captain and chief officer were bound to remain till the last, and go down with the ship as long as anyone else remained on board. These lives were saved, as they only could be, by the intuitive perception of the captain, guided by experience gained on the bridge, his power of instant decision, and of maintaining order amongst a medley of passengers, stokers, stewards, and others easily panic-stricken. The smartest and best-disciplined man-of-war could not have done better. It is to be regretted some notice had not been taken of it at the time, and consequently we are unable here to give his name. It was stated by the deputation that the engineers in our mercantile marine were better off, and consequently would not join the Navy. In a recent trial of a new ship in one of our great lines the chief engineer's pay was £280 a year, and £300 was the maximum in that line. It is believed £400 a year is rarely, if ever, attained by a chief engineer in a sea-going ship in the mercantile marine. Compare it with the pay of the naval engineers —shown in Part IV. of the *Annual*—who have half-pay, good pensions, almost constant employment, and no liability to summary discharge.

Those who have made passages in the mercantile marine know how very rarely even the chief engineer associates with the passengers. Sir W. Allen informs the First Lord we have come to a period "when you cannot place a scientific man in an inferior position." You *must* make him equal to any officer in the ship; you *must* give him "executive rank," or, in other words, as that term is at present understood, you must give him the right to command the ship. It would be interesting to know if the shipowners on the deputation approve of that doctrine in their own ships, or is it the opinion of the chairmen of our large steamship companies? It has never been previously claimed for the engineers that they are as a body scientific men. In all large bodies there are some men scientific to a certain degree, but in scientific knowledge the equals, if not superiors, of the engineers can be found amongst the gunnery, torpedo, and navigating

officers of the executive branch. The motor car is a scientific machine, and ladies drive it, for which they require eye, nerve, and judgment, but their scientific knowledge is nil. There is no necessity for an engine driver to be scientific, but there is for him to be practical. There is a Crimean story told of a party of bluejackets running a gun down hill and capsizing it. A general and his staff were passing, the former observed, "See what those confounded bluejackets have done. Mr. ——," turning to a young engineer officer, "how are we to get that gun upright?" The officer, turning to his note-book, said, "Two spars such and such a size, two blocks so many inches, and ropes such and such a size," etc., when a shout was heard, and on turning round the gun was upright, and the bluejackets running away merrily with it. The general drily observed, "There is a practical lesson worth all your theory." Lord C. Beresford and Mr. (now, I hope, most worthily Rear-Admiral E.) Benbow are admirable illustrations of the specialist theory. When under the fire of the Mahdi's guns on the Nile Lord Charles could not have repaired the engines as Mr. Benbow did, who on his part could not have successfully navigated the vessel through the intricacies of Nile navigation as Lord Charles did. "The shoe-maker to his last," is a good old saying. The first duty of a naval executive officer is to handle his ship in a seaman-like manner, and to command men. As "knowledge is power," the more he knows the more valuable he is.

On the old training.

All naval officers of rank have acknowledged they owe the most valuable part of their training to their earliest ships. In my first ship I was peculiarly fortunate. The captain gave me the run of his books, the first lieutenant kept me up to the mark in all practical work, and, in addition, for which he got little thanks at the time, took me to dances and parties. We corresponded for years after, almost to his death-bed, and from my "sea daddy," the late Captain Cowper Coles, who was the best boat sailer in the service of his day, I acquired a knowledge of boat sailing, an admirable nerve tonic, giving additional nerve to those who have been gifted with it, and a fair share to those who have not the natural gift. A few instances of work done by midshipmen may not be amiss here. The following extract was given to me by Admiral Luce, I believe the educationist of the United States Navy, from an American paper, when the British Fleet, under Admiral Sir John Hopkins, visited the United States with other European navies a few years ago. "Last year the words of Sir John Hopkins in favour of educating officers at sea, and the example of the sturdy little English reefers doing boat duty and in other responsible places, while American cadets were studying logarithms, created a very strong impression in

favour of shortening the term at Anapolis (the U.S. Naval College), and lengthening the term at sea. . . . Everything pertaining to this highly scientific training is purely experimental, for there is nothing in the whole course that tests whether the cadet is adapted for a sea officer. Unless he knows how to command men he may be a second Laplace in his studies, but he will be of no earthly account in the Navy. Or he may be a Nelson on board ship, but unless he has a knack for reciting in the class-room he cannot get a commission . . . . the young gentleman . . . . is apt to be cocky, and to make the grizzled lieutenant ill and weary of his theories of how things should be done. . . . The English middies are caught young, and the first thing they learn is the last thing the American cadets learn—how to control men and assume responsibility. A fifteen-year old midshipman in the British Navy has charge of a boat and every man in it, under all circumstances and in all weathers." No such similar remark was or could be made of other navies, as their midshipmen on joining are much older than ours. A naval cadet, a school-fellow of my own, successfully navigated two prizes from the west coast of Africa to St. Helena, an old petty officer being sent with him to assist him in the seamanship of the voyage. When the Undaunted was assisting in getting the Seignelay afloat a few years ago, the commander reports of the middies, "they worked famously, they were in watch and watch (*i.e.*, half the time on duty) in the boats and on deck, the mere lads of sixteen and a half, only a year and half out of the Britannia, proving most self-reliant and capable. I was glad to be able to tell them afterwards how well I thought they had borne the strain put on them, and that Captain King Hall (who commanded one of the ships present) also said he had never seen boats better handled."

The fruits of the old system-

When the Utopia, full of Italian emigrants, was sunk in Gibraltar Bay, the boats of the Channel Squadron were sent to save lives. The Commander-in-Chief reports that Mr. ——, midshipman, saved fifteen lives under circumstances that would have done credit to an officer of higher rank. Mr. ——, naval cadet, also saved some lives in a creditable manner (this latter is from memory, the main facts are correct), and at the time it was blowing fairly strong and a considerable swell on. A sub-lieutenant who had failed at two examinations was allowed a third because he had done good service afloat, but not having a mathematical head, he again failed, and of course had to leave the service. He went out to Rhodesia, commanded a Maxim gun in Jameson's attack on Lobengula, which ended in his kraal becoming Buluwayo, the present capital of Rhodesia. In the Matabele rebellion he obtained the Distinguished Service Order, on which

event he received numerous congratulations. In his reply to mine he writes: "Many thanks for your kind letter of congratulations. It is good to hear from anybody of the service; so many have written to me congratulating me on the little I have done out here. Ever since I left England for the second time I have been in the volunteer police forces in charge of the artillery. Now I am in the police still (Imperial not Chartered Company), and have about 26 guns and a section of mountain battery, and a pair of 12½-pounder quick-firing Maxim-Nordenfeldt field guns, also the depôt, about 300 men, and five forts within 60 miles of Buluwayo. . . . After all said and done for this country, there is nothing like the service for training one—engineering, land works, signalling gunners, etc., and last but not least, discipline comes in most useful." Whatever might be said against his lack of theoretical knowledge, there can be no doubt the Navy lost an excellent practical officer. In the siege of Ladysmith "picket duty at night was another form of campaigning work the Navy took part in. . . . Midshipmen were in command of these pickets, and considerable amusement, not to mention admiration, was caused by the easy self-confident manner in which these boys, some of them fresh from the Britannia, took charge of their men," and on other occasions, mentioned in the journal of the Naval Brigade, in South Africa midshipmen were very useful. In Sir Edward Seymour's ever-memorable attempt to relieve Pekin, midshipmen equally rose to the situation, and to whom did they owe it—not to schoolmasters, but to the naval officer under whom they were brought up, and brought into touch with the seamen.

Byron knew something of the Navy, and he writes:—

> "Or schoolboy midshipman that, standing by,
> Strains his shrill pipe, as good or ill betides,
> And well the docile crew that skilful urchin guides."
> —CHILDE HAROLD, Canto 2.

Sea training.

Of the usefulness of midshipmen in a man-of-war, or where they have been landed with a Naval Brigade, there is no doubt. The late Admiral of the Fleet Sir T. Symonds, G.C.B., under whom I was one of the midshipmen, always spoke of them as being a connecting link between the ship's company and the superior officers. It is not so much the case in the present day, but in many respects it holds good. By the new scheme all this excellent practical training from their own officers will be lost; and we have in its place a period of four years at college without going to sea. Consequently, they have no opportunity of profiting by this early, invaluable, practical naval training; being in touch with their earlier officers will be

lost, as well as knowledge of the men they will eventually have to command. From that excellent work "The Navy and the Nation," the joint production of Sir G. Sydenham Clarke and Mr. Thursfield, I will now quote Mr. Thursfield on the training of naval officers: "The sea itself, as the *Times* has said, is the one element of a seaman's experience that cannot be reduced to book knowledge, and must be assimilated on the quarter-deck." At p. 256, remarking on Sir Geoffrey Hornby taking his fleet out of Blacksod Bay without lights and in a gale of wind, also Admiral Baird bringing his fleet round from St. David's Head to St. Alban's Head without being able to make a visible signal, also of the little use made of pilots by our Navy, he says :—"The answer is that, in spite of some ill-judged attempts to make our modern naval officers mathematicians, mechanics, electricians, and what not, and some mischievous tendencies which make for the ascendancy of harbour training over sea training, the children are still worthy of their sires, still seamen in the sense of men trained to the emergencies of the sea, apt to command, prompt to obey, self reliant, and full of resource," as was shown in the late war by the manner they handled their guns, got them up into almost impossible positions, as shown at p. 288, "Naval Brigades in South Africa," far surpassing the Boers, whose guns always mounted the hills on the easy reverse slope, while ours had to make frontal attacks on the hill. The bluejackets soon became almost as expert in driving a team of oxen as the Kaffirs were. "How far they will retain these inestimable qualities, if some of their critics and counsellors have their way, is a question of vital moment to the nation, and nothing has occurred since to stultify them."* These remarks were penned only a few years ago. From the *Naval Brigade Journal* I see thirty-three midshipmen were landed, of whom two were killed in action and three died of enteric fever. I am not aware of the number landed in China, but some, I remember, were mentioned in despatches. Midshipmen, therefore, did not play an unimportant part during our late trouble, because they had learnt "how to control men," as the American paper previously quoted observed. After mentioning in terms of high admiration the admirable manner in which Commander Kearey overcame the intricacies of navigation of the Chinde mouth of the Zambesi, thereby opening up the very important point of the navigation of the Zambesi, and Shiré rivers, the latter being indispensable to the Colony, of which Blantyre is the capital, Mr. Thursfield writes: "I cite this as illustrating the normal manner in which the British naval officer goes about the performance of any duty which may fall in

* "The Navy and the Nation," p. 257.

his way, and I contend that the aptitudes it reveals are only to be engendered by the training of the seaman. Desk studies and book learning, and the profound scientific lore of Greenwich, the Excellent and Vernon are all very well in their way. . . . But in such exploits as the opening of the Zambesi they count for next to nothing, and the qualities required and displayed are such as no theoretical training can impart." It must, however, be remarked here the training of the Excellent and Vernon is very practical as well as theoretical, and our gunnery and torpedo officers have never been found deficient in practical knowledge. Whatever the merits of the new scheme may result in, I doubt if any will hope for better results than those I have given. They may be equalled, they cannot be surpassed; but the certainty of the present is to be given up for the problematical of the future.

The Navy has kept pace with the times.

At the sixth paragraph of the introductory remarks to the scheme it is stated: "It is difficult to measure the changes which have taken place in the last fifteen years," *i.e.*, to say from about the time of the Defence Act of 1889. This is perfectly correct, and in the aggregate the changes may be called revolutionary, and the result attained will be very difficult to surpass in the same time; but it was not obtained by a revolution, which looks ten years ahead, but by every step being carefully considered and not taken unless it could be easily retraced should it prove a mistake, and very few have been retraced. The Act of 1889 was passed in deference to public opinion, the real leaders of the Government in that case, the letters in the *Pall Mall Gazette*, about 1878, having thoroughly aroused the nation. The seed then sown was of slow growth, but resulted in admirable fruit—the Defence Act. Prior to that Act naval apathy was the characteristic of the Government and the nation alike. The naval supply of all ordnance stores was obtained from the War Office, which spent £400,000 of naval money annually without giving a single voucher to show how it was spent. The Director of Naval Ordnance's estimates were greatly reduced at the War Office, and by First Lords, without the slightest reference to him who had framed them, or giving him an opportunity of explaining them, or even suggesting the best manner of spending money granted. However, partial emancipation from the War Office in a great measure has enabled the Navy to go ahead and achieve some of the results of the last fifteen years, gradually perhaps, but surely. The Marconi system was very early analysed in the Vernon, and used by Admiral Domvile some years ago in the manœuvres, with the very useful result of obtaining information from his scouts sixty miles off, and at the present moment is very much in use in the

Navy, which is not behind the age in that respect if it is not considerably ahead of most departments.

It is not only the Navy afloat that has marched with the times, but the Civil Service at the Admiralty has equally progressed, and these two most important branches of the Naval Service are in most harmonious relationship with one another, which was certainly not the case forty years ago. Since then intermingling has produced its usual beneficial results, and I doubt if it ever can be improved upon. The procedure of our rulers in those fifteen years was real reform. They were content with seeing the visible horizon at every step, and as it necessarily moved on so did they. Now we are to move very rapidly, and not to be content but with our point being far beyond it and out of sight. Consequently, the inevitable mistakes arising from so vast a scheme cannot easily be remedied, as they will not be visible for some years. I have already dealt with the statement that in the past a naval officer need only be a sailor. I will only observe that if so, a good boatswain or gunner might have done as well in command as "any scion of a noble house." At the end of the same paragraph it is stated: "In dealing with this question the Board (alluding, I presume, to past Boards) have always been conscious of the supreme importance of preserving to the naval officer his unmistakable naval character. This character is developed from the early training in responsibility, the power of self reliance thereby engendered, and the essential unity of the service." Those qualities were developed, as I have previously pointed out, from our early training under naval officers. My second ship was a surveying ship. There was only one assistant surveyor in her—a lieutenant—the rest of the work was done by midshipmen, mostly under 3 years' standing in the service, who were away in charge of boats for several months during the summer at intervals, two in each boat for a fortnight or three weeks at a time, running lines of sounding, etc., ascending many a mountain in "the Isles of Greece" to obtain a round of theodolite angles. Another pair of midshipmen did the same work in another boat, so unless the captain was away half the surveying was done by midshipmen under able supervision. This chance was gained by the parsimony of the Admiralty in not giving assistant surveyor's pay to the master and another officer who had done surveying work for years unremunerated, and who struck that year.

Want of sea training.

This opportunity for gaining self-reliance, fearlessness of responsibility, etc., was not lost; excellent surveyors and seamen were the result. Under the proposed scheme, as all hands go to a naval college for four years, they have no chance of gaining these

opportunities, and also are losing touch with officers who have to command them, and of men they will have to command. They then go to sea-going ships for three years, where there is to be no school, for instruction in "seamanship, gunnery, navigation, torpedo work," and, in addition, mechanics and other applied science—marine engineering—by the respective officers of the ship, under the captain's supervision. Under-officered as the Navy is, these officers have quite sufficient to do in maintaining the efficiency of their ship. It does not appear that such a course as this could ever be carried out in a systematic manner in a sea-going ship with its constant changes in work, or in war time or even when preparing for war. The officers named have all sufficient work of their own to attend to, which they cannot perform efficiently if called on to be schoolmasters to boys of whom they know nothing. Something must suffer, either the efficiency of the ship or the scholastic duties, unless the various officers are admirable Crichtons, when they may be able to perform such duties; if so, they must be far superior to my generation, and I see all the less reason for this revolution. Lord Wemyss' adage of "leaving well alone"* is all the more *à propos*. After this seven years' service they then go to Greenwich for a three months' course "of mathematics, navigation and pilotage, followed by an examination, and afterwards to Portsmouth for a six months' course in gunnery, torpedo and engineering, at the close of which they will be examined" for the rank of sub-lieutenant, this means eight years in all, and I see no provision for seeing their family after leaving college.

Difficulties of the future.

These courses then diverge—the sub-lieutenants of the executive branch will go to sea for two years, keeping up the practical knowledge of their particular line. At the age of nineteen or twenty "the sub-lieutenant of the engineer branch will go to the college at Keyham for a professional course, the exact duration of which will be determined with great care;" *i.e.*, as it cannot commence till 1910 or 1911, some future Admiralty will have to settle the point. The cleverest will go to Greenwich, and be allowed further opportunities of obtaining practical and scientific acquaintance of marine engineering to fit them for their responsible duties. "The engineer branch will receive additional pay, and although it is *proposed* to make the division into the separate branches definite and final," every endeavour will be made to assimilate promotions, etc. The not unnatural question arises, What does "proposed" mean? Many understand, amongst them my friend the naval editor of the *Army and Navy Gazette*, that there will be an interchange of duties between the engine-room and bridge, and the prophetic correspondent

* Letter to the *Times*, January 14, 1903.

of the *Times* already alluded to "hopes in twenty years time to see our future Nelsons taken from the engine-room." If this is intended it should be clearly expressed; there should be no ambiguity on the subject to mislead ignorant or unwary parents. Sir F. Flannery, in his speech in the House on March 17, said, "Under the new scheme of the Admiralty it would be necessary to make larger payment to the engineers than to the other officers who enter the Navy under it. The distinction that exists to-day would continue to some extent. Cadets belonging to wealthy families would gravitate to the executive branch (not for their brains or fitness, but for wealth and social position), and the others to the engineer branch." The honourable member has let the cat out of the bag. The increased pay is a sop to Cerberus to console him for a lower social position than the other branch. Until I read this speech, I thought to promote a union of hearts was the grandest object of the scheme. I hope this is the object, but I have my doubts. As regards pay, I fail to see why the engineers should have more, for, as I have already pointed out, their responsibilities are far less than those of the executive. Their labours are less arduous at sea, and carried out under far easier circumstances than those of the executive, on whom, moreover, as a rule, fall the greater portion of the expenses involved in receiving and returning international civilities.

Comparative positions of engineers and executives.

In the debate on March 17 Sir F. Flannery, who was a prominent member of the political deputation to the First Lord in 1901, observed that in case of a breakdown: "The engineer at sea had to depend on his own resources, and he had to display the scientific skill of the present day." Practical knowledge is also quite as much, if not more, required than theory. I may say, if an executive officer gets his ship on shore, quite as much skill and science is required in addition to practical knowledge in getting her off as can ever be required in the engine-room, and in the instance I have already given it was not the engineer but the captain who saved the 140 lives, and who would have been held responsible for any mishap. In the Mercantile Marine this responsibility is fully recognised, and the captain receives considerably more pay than the chief engineer. I am glad to see Mr. E. Robertson, who has been at the Admiralty, and probably may be there again, calls attention to "a practice which prevailed in the Navy under which young officers were allowed to provide out of their own means for certain services of the ship." All this falls on the executive, and I have heard on good authority that large sums have been spent on a ship during a commission, not on "spit and polish," but to keep her

ordinarily respectable. Mr. Robertson contended that this expense and that of the bands should not fall on the officers, and most justly so. My own opinion on this point is that those who so spend their money are not wise, to put it mildly, and when Commander-in-Chief in China I told them so, and that it would gain no credit from me. I believe, if my memory is not wrong, I wrote to the Admiralty, saying I would rather see the ships disreputable in the presence of foreigners than reputable if kept so by officers' private means. It gives an undue advantage to the wealthy. It is, of course, on their part a sort of bid for promotion, as honours are won ashore by contributions to the Carlton and other political clubs, dinners, etc.

Now, if it is not intended the engineers are ever to take charge on the bridge, it not unnaturally occurs to one, what benefit does the engineer gain by going to sea for three years in ships where "there is no school"? What use will seamanship, navigation, and pilotage be to them as engineer officers, and the Greenwich and Portsmouth courses occupying with leave another year?

Engineering requirements.

Sir F. Flannery also deprecates—in the House of Commons, March 17—"the age which has been selected for an engineer to begin his workshop experience, and if it could be arranged that workshop practice could commence at an earlier age for the engineer officer it would tend to greater efficiency of the service as a whole"—a point on which most will agree, and which is a strong condemnation of the proposed system from one of its advocates—and agrees with my very competent Australian correspondent, who fixes seventeen as the age to commence workshop training, instead of at twenty or twenty-one; and, as we are all aware, three years wasted at that age, learning what can be of no use, cannot be regained.

The Marine officers

"The Marine officer, after passing his examination for sub-lieutenant, having gone through the same course as the future executive and engineer officer, will receive his special military training during the next two years partly at the college at Greenwich and partly at the headquarters of a division." He is then to receive the rank and pay of a lieutenant of Royal Marines, so as to put him financially on an equality with the executive sub-lieutenant, which is a very curious statement, as a lieutenant Royal Marines receives five shillings and sevenpence a day and the executive sub-lieutenant, with whom he ranks, only five shillings, and most certainly to the uninitiated the title lieutenant Royal Marines would certainly appear to be of higher rank than the executive or engineer sub-lieutenant. A reformation in titles is obviously desirable.

It would also be desirable to know how or when "the year's watch at sea," necessary before he can become a gunnery or torpedo

lieutenant, is to be kept. Is it to be as officer of the watch and in charge of the ship at sea, after he has been over two years on shore learning totally different work? He will probably have forgotten most of what he learnt in his three years in a sea-going ship. Does the Board of Admiralty mean that after three years at sea, at once followed by two to three, perhaps four, years ashore, he is then to take charge of a watch at sea? If so, the Admiralty will have to settle that matter by direct command, for no captain in his senses would of his own accord give a Marine officer charge of a watch at sea in preference to an executive sub-lieutenant who had spent the same time at sea. There is another very important point to consider. In the past subalterns of Marines always had a cabin and messed in the ward-room. I presume it originated when mates, as sub-lieutenants were then called, were only warrant-officers, and liable to be disrated. Now they are commissioned officers, as are the engineer sub-lieutenants, and cabins should be allotted by seniority. As Admiral Fitzgerald wrote to the *Times*, the parting of the ways is more likely to lead to disunion than union. It is well known, even in far less ambitious changes than this, that numerous explanatory memos are necessary.

It will be seen from the tables of rates of pay that there is not one word with regard to that of the executive, either in the scheme or in any circular issued subsequently.* I supposed there was some oversight in this omission, and purposely kept this portion to the last. The remark of Sir F. Flannery in the House on the 18th March that "it would be necessary to make a larger payment to the engineers than to other officers who would enter the Navy under the scheme" . . . "as cadets of the wealthier families would gravitate to the executive branch," seems to explain the omission, as Sir F. Flannery was a leading member of the deputation to the First Lord in 1901, which seems to have had a considerable effect in the production of this scheme. On the pay of the executive.

Comparing the tables of pay in Part IV., it will be seen that the sub-lieutenant, who ranks with a lieutenant R.M., receives 5*s.* a day against the 6*s.* 4*d.* and 5*s.* 11*d.* of the R.M. The executive lieutenant under eight years receives 10*s.* a day, the same as he did in 1842, the year before I went to sea. The engineer, with whom he ranks, receives from 10*s.* to 13*s.*; the Marine officer: artillery 12*s.* 1*d.* to 14*s.* 7*d.*, infantry 11*s.* 7*d.* to 14*s.* 1*d.* The executive lieutenant over eight years receives from 12*s.* to 14*s.* a day; the major R.M., with whom he ranks, receives: artillery from 16*s.* 1*d.* to 18*s.* 6*d.*, infantry 15*s.* 7*d.* to 18*s.* 6*d.*, and the engineer

* Part IV., p. 482.

from 16*s.* to 20*s.* a day. The commander, who ranks with a lieutenant-colonel, receives 20*s.* a day and no increase, the latter receives 21*s.* to 22*s.* 6*d.*, and the engineer commander from 24*s.* a day to 33*s.* day. The executive naval officers are obliged to have a certain amount of service at sea. So far as mention goes, neither the engineer nor Marine officer are obliged to have sea time. And the Marines have no half pay, and have splendid quarters to go to, while the naval officer on paying off has to go to lodgings and half pay, on which, unless he has private means, he cannot keep up the position of an officer and gentleman, unless he sacrifices his belly to his back.*

Favouritism.

Mr. Robertson (Dundee) points out in his speech on the 17th of March :—The scheme violates "the principle of open competition in the public service" (he might have added in some private establishments also), "and bases the whole naval service on patronage in the first instance, and on class influence in the second," and the Secretary to the Admiralty did not deny it, so there can be no doubt of it. And on this subject it is worthy of note to read in the memoirs of Admiral Lord Clarence Paget, a Liberal in politics, who was six years Secretary to the Admiralty, and always considered a gross jobber, that he denounces in very strong terms the immense amount of patronage in the hands of the First Lord of the Admiralty, which could be used for political purposes, as would undoubtedly be the case when political parties are evenly balanced. "Party first and the nation and Navy afterwards" is usually the political maxim. Every branch of the public service has gained by open competitive examination, and I suppose Ministers had also, as it removed them from political and social influence so difficult to resist when parties are evenly balanced. Of all services the Navy should be the last governed by politics, as has been well pointed out by Oppenheim.

Mr. Haldane is a sanguine man.† "He hoped assurance would be given that this duty"—the invidious one of selection, of weeding out—"would be performed in the most public manner so that no jobbery would be possible." Assurances will be given in abundance; performances will be in an inverse ratio—and that and selection at the parting of the ways will lead, as Admiral Fitzgerald observed, to much heart-burning, and will not be conducive to union of hearts, so much dwelt on in "this scheme." Mr. Robertson (Dundee) pointed out this "immense experiment" (a most applicable term for it) "was nothing else but the offspring of the existence in the Navy of that

* Executive officers in command have an additional allowance, which partially meets the expense of keeping a separate table.

† In the House of Commons, March 17.

accursed spirit of class distinction, which was 'the poison' of the whole life of the country."

In ward-room and gun-room messes we have, or have had, all classes, from royalty down to the lower middle classes ; and everyone in them is, when afloat, on the same social footing. When the ship is paid off every one then returns to his own class. Social difference now as ever in the past exists, and it does not take a prophet to say it will in the future, till God gives everyone equal brain power and equal opportunities, and then what would be said of the "servant difficulty ?"

It would not be a bad idea if someone would try to make his gardener, coachman, or butler be educated on the same plan of interchangeable duties, and, if a success, it would be very convenient if any one of them was sick. I would prefer to see the result before trying it myself. I shall be very much surprised if foreign navies, who have hitherto followed our lead in naval matters, follow us in this scheme ; and as imitation is the sincerest form of flattery, it would be gratifying to our naval revolutionists if they did.

Concluding remarks

In conclusion, I cannot do better than prove how admirably the Navy fulfilled its functions in our late war. In the first place, the Navy prepared during "the last fifteen years" was sufficiently respected by foreigners to keep them "from fooling us," to use Blake's phrase of two and a half centuries ago, even when affairs looked their blackest in South Africa—a very important point for a country existing by its commerce. It is, of course, well known that the military had decided that a Naval Brigade was not to form part of the Army. Events, however, were too strong, for on the 13th of October, 1898, two days after war was declared, one was telegraphed for, and although no preparations had been made for the contingency, it was promptly met, and on the 20th one was en route for the front, where, as we all know, it kept up the best traditions of the Navy, particularly at Graspan.

On the 25th of October Sir G. White telegraphed urgently for naval guns to encounter the fire of the far superior Boer artillery. Carriages, which answered admirably, were designed by a naval officer on the spot for these heavy guns, and constructed by the artificers at Simon's Bay, and on board the ship en route to Durban. On the 30th of October those guns were in position at Ladysmith, and covered the retreat from Rietfontein, and Sir G. White observed to Captain Lambton : "You have saved the situation." A naval engineer also constructed a condensing machine, which saved much enteric fever by giving the garrison pure water to drink

instead of muddy. A Dutch pastor observed to one of our naval officers: "It was not fair to bring up sailors and ships' guns to fight us."

The work of the Navy in China, under our naval Commander-in-Chief, was equally important, and much more hazardous. There, however, the honour was shared by contingents of other nationalities. And last, but not least, how admirably the Transport Department was managed by sailors of the Royal and Mercantile Marines without a hitch, something above the mere sailor being required for such important work. Nothing more fully proves the value of time in war. Only two or three days after the arrival of the Naval Brigade at Ladysmith the route to the south was closed. No one can deny but that our Naval Brigades made admirable gunners and soldiers during the war, and in Rawson's Benin expedition. The general who commanded at the re-crossing of the Tugela after the repulse at Spion Kop observed of the seamen ferrying the retreating troops across: "they were worth their weight in gold." In my opinion, better results than these could not have been obtained under any system. No one can deny the admirable manner in which our ships and squadrons are handled and navigated even in unknown waters, and I am more proud of being one of the band of naval officers who have educated the best rising generation the Navy has ever known than I am of any part of my career. The "seamanship, gunnery, and soldiering," have already been admirably carried out under the inductive system—and it never will be bettered—and I very much doubt if more engineering can be learnt under the new scheme for the executive branch, and the little knowledge they may learn of management and handling of tools can be of no more use to them than the three years at sea to the engineers, learning seamanship, pilotage, and navigation, if they are to remain engineers. Mr. Brodrick's Army scheme was violently opposed at first, but now there is rather a reaction for it. The Admiralty scheme received great applause before it was ever considered. I should not be astonished if a reaction set in. It appears that the custodians of the public purse have never asked a question as to the expense. No opportunity is therefore afforded the country of judging whether it is worth incurring a large expense for a little more knowledge of engineering and use of tools—the three most important qualities already existing.

R. Vesey Hamilton.

PART II.

BRITISH AND FOREIGN ARMOURED AND UNARMOURED SHIPS.

PART II.

ALPHABETICAL LIST OF BRITISH AND FOREIGN ARMOURED AND UNARMOURED SHIPS.

The arrangement of the lists of ships has again undergone important modifications. The order of the columns corresponds in the British and Foreign Lists, except that in the former there are spaces for the makers of engines. The principal change has been in further developing the columns devoted to protection. In the case of armoured ships, in addition to belt and deck armour, the side armour above the belt is shown, as well as the protection given both to main and secondary guns. This alteration will add considerably to the value of the tables. The calibre of all foreign guns is given in inches.

Another change is in stating the dates both of launch and completion throughout. Where a second date occurs in the "Launch" column, it is that of the reconstruction of the vessel.

The maximum draught at normal displacement has been given wherever it was possible to ascertain it.

As every nation is constantly rearranging the armament of individual ships, it is only possible to publish the latest accessible information.

Torpedo boats of all classes below torpedo-gunboats are placed in a separate list.

It will be understood that considerable difficulty is found in giving the exact cost of ships, especially of those in foreign navies. The

system adopted is to give the cost of the ships complete, including armament, and where that is impossible, an indication is given of the fact.

Storeships, Harbour Service Ships, and Training Ships are not included in these lists, except in some cases as footnotes to the tables.

The ships of those Powers whose Navies are of small importance will be found at the end of Part II.

The following abbreviations are used throughout the Alphabetical List, occurring mainly in the first column, showing the class of ship, and in the armour column:—

a.c.	Armoured cruiser.	H.S.	Harveyised or similar hard-faced steel.
a.g.b.	Armoured gunboat.	K.S.	Krupp steel.
b.	Barbette ship.	shd.	Sheathed.
c.b.	Central-battery ship.	2 s.	Twin screw.
c.d.s.	Coast-defence ship.	*t.*	Turret-ship (in class column).
comp.	(in armour column). Compound or steel-faced armour.	*t.*	Trial speed and I.H.P. at trials (in speed and I.H.P. columns).
corv.	Corvette.	to.cr.	Torpedo-cruiser.
cr.	Cruiser.	to.g.b.	Torpedo-gunboat.
d.v.	Despatch vessel.	to.r.	Torpedo-ram.
g.b.	Gunboat.		
g.v.	Gun-vessel.		

Armament Abbreviations.—As breech-loading rifled guns are now almost universal in all fleets, it must be understood that all guns are of that description, unless it be otherwise indicated. As most guns of 6-in. calibre and under are quick-firers the letters Q.F. have been omitted.

l.	Light guns under 15 cwt., including boats' guns.
M.L.R.	Muzzle-loading rifled guns.
M.	Machine guns.
f. tu. or b. tu.	Fixed or bow tube for discharging fish torpedoes.
sub.	Submerged tube for do.
A.	Armstrong guns.
K.	Krupp guns.

Boilers.—It has been thought desirable to indicate particulars of the water-tube boilers adopted in the principal fleets. The following abbreviations have, therefore, been given in the column devoted to indicated horse-power. Where no reference occurs the boilers are of the cylindrical type; but the letter "C" implies that

cylindrical boilers are used in conjunction with the type of water-tube boilers indicated:—

W.T.	Water-tube boilers, where the type is not known or not yet decided.
B.	Belleville.
Bl.	Blechynden.
B. & W.	Babcock and Wilcox.
D'A.	D'Allest.
D.	Dürr.
E.	Earle.
Ex.	Express.
Du T.	Du Temple.
L.	Laird.
L.N.	Laird-Normand.
M.	Mumford.
Nic.	Niclausse.
Nor.	Normand.
N.S.	Normand-Sigaudy.
R.	Reed.
T.	Thornycroft.
T.S.	Thornycroft-Schulz.
W.F.	White-Forster.
Y^1.	Yarrow small tube.
Y^2.	„ large tube.

In the column giving coal supply, where two figures occur, that below the line indicates the maximum.

GREAT BRITAIN.—Armoured Ships.

Class	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Makers of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.	in.	in.	in.	in.			knots.	tons.	
a.c.	Aboukir shd.	12,000	440	69½	26¼	21,000 B.	Fairfield	Fairfield	1900	1902	783,883	6–2 K.S.	3–1½	..	5 H.N.	6 K.S.	..	2 *9·2-in.*, 12 *6-in.*, 12 *12-pr.*, 3 *3-pr.*, 8 M., 2 l.	2	21	800 / 1600	755
b. 1st cl.	Albemarle	14,000	405	75½	26½	18,296 B.	Chatham	Thames Ironworks	1901	..	1,094,396	7–3 K.S.	2–1	..	7 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 12 *6-in.*, 10 *12-pr.*, 6 *3-pr.*, 8 M., 2 l.	4	18·6 t	900 / 2000	750
b. 1st cl.	Albion	12,950	390	74	26	13,500 B.	Blackwall	Maudslay	1898	1902	883,805	6–2 H.N.	3–1	..	12–8 H.N.	12–6 H.N.	5 H.N.	4 *12-in.*, 12 *6-in.*, 10 *12-pr.*, 6 *3-pr.*, 8 M., 2 l.	4	18·25 t	1000 / 2300	700
a.c.	Antrim	10,700	450	68½	25	21,000 Y. & cyl.	Clydeb'nk	J. Brown & Co.	Bldg.	..	810,471	6–2 H.N.	2–¾	..	4½ H.N.	6 H.N.	6 H.N.	2 *7·5-in.*, 10 *6-in.*, 6 *37-mm.*, 17 *3-pr.*, 2 M., 2 l.	2	22·25 t	800 / 1950	655
a.c.	Argyll					21,000 B. & W. & cyl.	Greenock	Greenock Foundry	Bldg.	..	793,111											
b. 2nd c.	Anson	10,600	330	68½	27¼	11,500	Pembroke	Humphrys	1886	1889	780,667	18–8 comp.	3–2½	..	16–6 comp.	14–12 comp.	..	4 *13·5-in.*, 6 *6-in.*, 12 *6-pr.*, 10 *3-pr.*, 7 M., 2 l.	5	16·75 t	900 / 1200	515
a.c.	Aurora*	5600	300	56	24½	8500	Pembroke	Thomson	1887	1889	326,110	10 comp.	3–2	..	16 comp.	..	..	2 *9·2-in.*, 10 *6-in.*, 3 *9-pr.*, 6 *6-pr.*, 10 *3-pr.*, 6 M.	2	18	750 / 900	485
a.c.	Australia						Glasgow	Napier	1886	1888	299,027											
a.c.	Bacchante shd.	12,000	440	69½	26¼	21,000 B.	Clydeb'nk	J. Brown	1902	1902	787,230	6–2 K.S.	3–1½	..	5 H.N.	6 K.S.	..	2 *9·2-in.*, 12 *6-in.*, 12 *12-pr.*, 3 *3-pr.*, 8 M., 2 l.	2	21	800 / 1600	755
b. 2nd c.	Barfleur shd.	10,500	360	70	25½	13,163	Chatham	Greenock Foundry	1892	1894	616,102	12 comp.	2½–2	4 N.S.	8 comp.	9 comp.	4–2 N.S.	4 *10-in.*, 10 *6-in.*, 2 *9-pr.*, 8 *6-pr.*, 12 *3-pr.*, 7 M.	7	18·50	750 / 1240	625
a.c.	Bedford	9800	440	66	24½	22,457 B.	Fairfield	Fairfield	1901	..	716,702	4–2 K.S.	2–¾	..	3 K.S.	4 K.S.	4 K.S.	14 *6-in.*, 8 *12-pr.*, 3 *3-pr.*, 2 M., 2 l.	2	22·7 t	740 / 1760	687
b. 2nd c.	Benbow	10,600	330	68½	27¼	11,500	Blackwall	Maudslay	1885	1888	830,683	18–8 comp.	3–2½	..	18–6 comp.	14–12 comp.	..	2 *16·25-in.*, 10 *6-in.*, 12 *6-pr.*, 10 *3-pr.*, 7 M., 2 l.	5	16·75 t	900 / 1200	510
a.c.	Berwick	9800	440	66	24½	22,000 Nic.	W. Beardmore & Co.	Humphrys	1902	Bldg.	773,754	4–2 H.S.	2¾	..	5 N.S.	5–4 N.S.	4 N.S.	14 *6-in.*, 10 *12-pr.*, 3 *3-pr.*, 9 M.G.	2	23·0	800 / 1600	655
a.c.	Black Prince	13,550	480	73½	27	23,500 W.T. & cyl.	Blackwall	Thames Ironworks	Bldg.	..	[†]	6 K.S.	..	6	..	6	6	6 *9·2-in.*, 10 *6-in.*, 28 small.	2	22·5	..	..
b. 1st cl.	Bulwark	15,000	400	75	26¾	15,000 B.	Devonp't	Hawthorn	1899	1902	1,082,805	9 H.S.	3–2	3 K.S.	12 H.S.	12–5 H.S.	6–2 K.S.	4 *12-in.*, 12 *6-in.*, 16 *12-pr.*, 6 *3-pr.*, 8 M., 2 l.	2	18·0	900 / 2000	750
b. 1st cl.	Cæsar	14,900	390	75	27½	12,000	Portsm'th	Maudslay	1896	1897	935,746	9 H.S.	4–2½	..	14–9 H.S.	14–6 H.S.	6 H.S.	4 *12-in.*, 12 *6-in.*, 18 *12-pr.*, 12 *3-pr.*, 8 M., 2 l.	5	17·5	900 / 2000	757
b. 2nd c.	Camperdown	10,600	330	68½	27¼	11,500	Portsm'th	Maudslay	1885	1889	825,448	18 comp.	3–2½	..	16 comp.	12 comp.	..	4 *13·5-in.*, 6 *6-in.*, 12 *6-pr.*, 10 *3-pr.*, 7 M., 2 l.	4	16·9 t	900 / 1200	515
b. 1st cl.	Canopus	12,950	390	74	26	13,500 B.	Portsm'th	Greenock Foundry	1897	1900	924,398	6 H.S.	..	2 N.S.	12 H.S.	12–5 H.S.	5 H.S.	4 *12-in.*, 12 *6-in.*, 10 *12-pr.*, 6 *3-pr.*, 8 M., 2 l.	5	18·25	800 / 1850	700
a.c.	Carnarvon	10,700	450	68½	25	21,000 Nic. & cyl.	Beardm're	Humphrys	Bldg.	..	784,020	6–2 K.S.	2–¾	..	4½ K.S.	6 N.S.	6	2 *7·5-in.*, 10 *6-in.*, 10 *12-pr.*, 3 *3-pr.*	2	22·25	800	655
b. 2nd c.	Centurion shd.	10,500	360	70	25½	13,214	Portsm'th	Greenock Foundry	1892	1893	624,402	12 comp.	2½–2	4 N.S.	12 comp.	9 comp.	6–2 K.S.	4 *10-in.*, 10 *6-in.*, 8 *6-pr.*, 12 *3-pr.*, 7 M., 2 l.	7	18·25	750 / 1125	625
b. 2nd c.	Collingwood	9500	325	68	26¾	9500	Pembroke	Humphrys	1882	1886	..	18 comp.	2½	..	16 comp.	12 comp.	..	4 *12-in.*, 6 *6-in.*, 12 *6-pr.*, 8 *3-pr.*, 6 M., 2 l.	4	16·50	900 / 1200	480
t. 3rd c.	Colossus‡	9420	325	68	26½	5500	Portsm'th	Maudslay	1882	1886	..	18–14 comp.	3–2½	..	16–13 comp.	16 comp.	..	4 *12-in.*, 5 *6-in*, 4 *6-pr.*, 10 *3-pr.*, 6 M., 4 l.	2	14·2 t	970	388
b. 1st cl.	Commonwealth	16,350	425	78	26¾	18,000	Fairfield	Fairfield	Bldg.	..	1,322,936	9 H.S.	2–1	8	12 H.S.	12–6 H.S.	7 K.S.	4 *12-in.*, 4 *9·2-in.*, 10 *6-in.*, 24 small.	2	18·5	950	800
t. 3rd c.	Conqueror	6200	270	58	24	6000	Chatham	Humphrys	1881	1882	..	12–8½	2½–1¾	..	11½	12	..	2 *12-in.*, 4 *6-in.*, 6 *6-pr.*, 12 M., 2 l.	6	15·3 t	650	330
a.c.	Cornwall	9800	440	66	24½	22,000 B. & W.	Pembroke	Hawthorn	1902	..	770,910	4–2 H.S.	2–¾	..	5 N.S.	5–4 N.S.	4 N.S.	14 *6-in.*, 10 *12-pr.*, 3 *3-pr.*, 9 M.	2	23·0	800 / 1600	655
b. 1st cl.	Cornwallis	14,000	405	75½	26¾	18,238 B.	Blackwall	Thames S. Co.	1899	..	1,083,282	7 K.S.	..	1½	14 K.S.	11–6 K.S.	6 K.S.	4 *12-in.*, 12 *6-in.*, 12 *12-pr.*, 6 *3-pr.*	4	18·9 t	900 / 2000	750
a.c.	Cressy shd.	12,000	440	69½	26¼	21,000 B.	Fairfield	Fairfield	1899	1901	780,110	6 K.S.	3–2	..	5 K.S.	6 K.S.	..	2 *9·2-in.*, 12 *6 in.*, 12 *12-pr.*, 3 *3-pr.*, 8 M., 2 l.	2	21·0	800 / 1600	755
a.c.	Cumberland	9800	440	66	24½	22,000 B.	London & Glasgow Co.	London & Glasgow Co.	1903	..	748,447	4–2 K.S.	2–¾	..	5	5–4	4 N.S.	14 *6-in.*, 10 *12-pr.*, 3 *3-pr.*, 9 M.	2	23·0	800 / 1600	655

* Being overhauled by Messrs. John Brown & Co., Clydebank. † Details of cost incomplete. ‡ Being overhauled by the Thames Shipbuilding Co., Blackwall.

GREAT BRITAIN.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.	in.	in.	in.	in.			knots.	tons.	
a.c.	Devonshire	10,700	450	68½	25	21,000 Nic. & cyl.	Chatham	Thames Ironworks	Bldg.	..	†	6–2	2–¾	..	4½ K.S.	6 N.S.	6	2 7·5-*in.*, 10 6-*in.*, 10 12-*pr.*, 3 3-*pr.*	2	22·25	800 / 1600	655
t. 3rd c.	Devastation	9330	285	62¼	27½	7000	Portsm'th	Maudslay	1871	1873	..	12–10	3–2	..	12–10	14	..	4 10-*in.*, 6 6-*pr.*, 8 3-*pr.*, 5 M., 2 l.	2	14·0	1800	410
b. 1st cl.	Dominion	16,350	425	78	26¾	18,000	Barrow	Vickers	Bldg.	..	1,305,744	9 K.S.	2–1	8 K.S.	12 K.S.	12–6 K.S.	..	4 12-*in.*, 4 9·2-*in.*, 10 6-*in.*, 24 small.	2	18·5	950	800
a.c.	Donegal	9800	440	66	24½	22,000 B.	Fairfield	Fairfield Co.	1902	..	748,072	4–2 K.S.	2–¾	..	5 K.S.	5–4	4 K.S.	14 6-*in.*, 10 12-*pr.*, 3 3-*pr.*, 9 M.	2	23·0	800 / 1600	655
a.c.	Drake	14,100	500	71	26	30,557 B.	Pembroke	Humphrys	1901	1902	1,050,675	6 K.S.	3–2	2 K.S.	5 K.S.	6–5 K.S.	5 K.S.	2 9·2-*in.*, 16 6-*in.*, 14 12-*pr.*, 3 3-*pr.*	2	23·0 *t*	1250 / 2500	900
t. 3rd c.	Dreadnought	10,820	320	63¾	26¾	6500	Pembroke	Humphrys	1875	1875	†	14	3–2	..	13	14	..	4 12·5-*in.* M.L.R., 6 6-*pr.*, 12 3-*pr.*, 7 M., 2 l.	2	13·7 *t*	1200	453
a.c.	Duke of Edinburgh	13,550	480	73½	27	23,500 B. & W. & cyl.	Pembroke	Hawthorn Leslie	Bldg.	..	†	6 K.S.	..	6	..	6	6	6 9·2-*in.*, 10 6-*in.*, 28 small.	2	22·0	..	..
b. 1st cl.	Duncan	14,000	405	75½	26½	18,222 B.	Blackwall	Thames S. Co.	1901	..	1,081,024	7 K.S.	..	1½ K.S.	14 K.S.	11–6 K.S.	6 K.S.	4 12-*in.*, 12 6-*in.*, 12 12-*pr.*, 6 3-*pr.*	4	18·9 *t*	900 / 2000	750
t. 3rd c.	Edinburgh	9420	325	68	26¼	5500	Pembroke	Humphrys	1882	1886	†	18–14 comp.	3–2½	..	16–13 comp.	16 comp.	..	4 12-*in.*, 5 6-*in.*, 4 6-*pr.*, 10 3-*pr.*, 6 M., 2 l.	2	14·2	970	388
b. 1st cl.	Empress of India	14,000	380	75	27½	13,000	Pembroke	Humphrys	1891	1893	902,788	18–5 comp.	3	5	16 comp.	17–6 comp.	6–2 K.N.C.	4 13·5-*in.*, 10 6-*in.*, 16 6-*pr.*, 12 3-*pr.*, 8 M., 2 l.	7	17·5 *t*	900 / 1450	740
a.c.	Essex	9,800	410	66	24½	22,000 B.	Pembroke	John Brown	1901	Bldg.	746,590	4–2 K.S.	2–¾	4 K.S.	5	5	4 K.S.	14 6-*in.*, 8 12-*pr.*, 3 3-*pr.*, 8 M., 2 l.	..	23·0	800 / 1600	655
a.c.	Euryalus shd.	12,000	440	69½	26¼	21,000 B.	Barrow	Vickers	1901	Bldg.	804,259	6 K.S.	3–2	2	5 K.S.	6 K.S.	..	2 9·2-*in.*, 12 6-*in.*, 14 12-*pr.*, 3 3-*pr.*, 8 M.	2	21·0	800 / 1600	755
b. 1st cl.	Exmouth	14,000	405	75½	26½	18,346 B.	Laird	Laird	1901	Bldg.	1,094,848	7 K.S.	..	1½ K.S.	14 K.S.	11–6 K.S.	6 K.S.	4 12-*in.*, 12 6-*in.*, 12 12-*pr.*, 6 3-*pr.*	4	19·0	900 / 2000	750
b. 1st cl.	Formidable	15,000	400	75	26¾	15,000 B.	Portsm'th	Earle	1898	1901	1,079,432	9 H.S.	3–2	2	12 H.S.	12–5	8 K.S.	4 12-*in.*, 12 6-*in.*, 16 12-*pr.*, 6 3-*pr.*, 8 M., 2 l.	..	18·0	900 / 2000	750
a.c.	Galatea	5600	300	56	24½	8500	Glasgow	Napier	1887	1889	291,803	10 comp.	3–2	..	16 comp.	4½	..	2 9·2-*in.*, 10 6-*in.*, 6 6-*pr.*, 10 3-*pr.*, 6 M., 3 l.	4	18·1 *t*	900	484
b. 1st cl	Glory	12,950	390	74	26	13,500 B.	Laird	Laird	1899	1901	888,649	6 H.S.	3–2	2 N.S.	12 H.S.	12–5 H.S.	5 H.S.	4 12-*in.*, 12 6-*in.*, 10 12-*pr.*, 6 3-*pr.*, 8 M., 2 l.	5	18·25	800 / 1850	700
b. 1st cl	Goliath	12,950	390	74	26	13,500 B.	Chatham	Penn	1898	1900	915,588											
a.c.	Good Hope	14,100	500	71	26	31,088 B.	Fairfield	Fairfield	1901	1902	1,023,629	6 K.S.	3–2	..	5 K.S.	6–5 K.S.	5 K.S.	2 9·2-*in.*, 16 6-*in.*, 14 12-*pr.*, 3 3-*pr.*, 9 M.	2	23·0 *t*	1250 / 2500	900
a.c.	Hampshire	10,700	450	68½	24½	21,000 Y. & cyl.	Elswick	Hawthorn.	Bldg.	Bldg.	778,362	6–2 K.S.	2–¾	..	5 K.S.	5–4 N.S.	..	2 7·5-*in.*, 10 6-*in.*, 10 12-*pr.*	2	23·0	800 / 1600	655
b. 1st cl.	Hannibal	14,900	390	75	27½	12,000	Pembroke	Harland	1895	1897	958,877	9 H.S.	4–2½	..	14–9 H.S.	14–6 H.S.	6 H.S.	4 12-*in.*, 12 6-*in.*, 18 12-*pr.*, 12 3-*pr.*, 8 M., 2 l.	5	17·5	900 / 2200	757
t. 3rd c.	Hero	6200	270	58	24	6000	Chatham	Rennie	1885	1888	473,575	12 comp.	..	..	11½ comp.	12 comp.	..	2 12-*in.*, 4 6-*in.*, 7 6-*pr.*, 12 M., 2 l.	6	15·2	620	330
b. 1st cl.	Hindustan	16,350	425	78	26¾	18,000	Clydeb'nk	J. Brown & Co.	Bldg.	Bldg.	†	9 K.S.	2–1	..	12 K.S.	12 N.S.	6 N.S.	4 12-*in.*, 4 9·2-*in.*, 10 6-*in.*, 24 small.	2	18·5	950	800
a.c.	Hogue shd.	12,000	440	69½	26¼	21,000 B.	Barrow	Vickers	1900	1902	787,507	6 K.S.	3	2 H.S.	5 K.S.	6 K.S.	..	2 9·2-*in.*, 12 6-*in.*, 12 12-*pr.*, 3 3-*pr.*, 8 M., 2 l.	2	22·0	800 / 1600	755
t. 1st cl.	Hood	14,150	380	75	27½	13,000	Chatham	Humphrys	1891	1893	914,836	18 comp.	3	5 comp.	17 comp.	18–6 comp.	6–2	4 13·5-*in.*, 10 6-*in.*, 10 6-*pr.*, 12 3-*pr.*, 8 M., 2 l.	7	17·5	900 / 1800	730
c.d.s. *t.*	Hotspur	4010	235	50	21¾	2500	Glasgow	Napier	1870	1871	†	11 & 8	2–1	..	8	10–8½	..	2 12-*in.* M.L.R., 2 6-*in.*, 6 12-*pr.*, 4 3-*pr.*, 8 M., 2 l.	..	11·25 *t*	300	232
b. 1st cl.	Howe *	10,300	325	68	27¼	11,500	Pembroke	Humphrys	1885	1889	766,597	18 comp.	3–2½	..	16 comp.	11½ comp.	..	4 13·5-*in.*, 6 6-*in.*, 12 6-*pr.*, 10 3-*pr.*, 7 M., 2 l.	1	16·8	900 / 1200	515
b. 1st cl.	Illustrious	14,900	390	75	27½	12,000	Chatham	Penn	1896	1898	950,804	9 H.S.	4–2½	..	14–9 H.S.	14–6 H.S.	6 H.S.	4 12-*in.*, 12 6-*in.*, 18 12-*pr.*, 12 3-*pr.*, 8 M., 2 l.	5	17·5	900 / 2200	757
a.c.	Immortalité	5600	300	56	22½	8500	Chatham	Earle	1887	1889	332,359	10 comp.	3–2	..	16 comp.	4½	..	2 9·2-*in.*, 10 6-*in.*, 6 6-*pr.*, 10 3-*pr.*, 6 M., 3 l.	2	18·0	900	484
a.c.	Impérieuse shd.	8400	315	62	27¼	10,000	Portsm'th	Maudslay	1883	1886	†	10 comp.	4–2	..	9 comp.	4½ comp.	..	4 9·2-*in.*, 10 6-*in.*, 8 6-*pr.*, 10 3-*pr.*, 6 M., 2 l.	6	16·7 *t*	900 / 1130	544

* Being overhauled at Jarrow. † Details of cost incomplete.

GREAT BRITAIN.—Armoured Ships—*continued.*

Class	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.	in.	in.	in.	in.			knots.	tons.	
b. 1st cl.	Implacable	15,000	400	75	26¾	15,000 B.	D'port	Laird	1899	1902	1,075,277	9 K.S.	3–2	2	12 K.S.	12–5 K.S.	8	4 *12-in.*, 12 *6-in.*, 16 *12-pr.*, 6 *3-pr.*, 8 M., 2 l.	2	18·0	900 / 2000	755
	Irresistible						Chatham	Maudslay	1898		1,081,391											
	London						Portsm'h	Earle	1899		1,114,808											
a.c.	Kent	9800	440	66	24½	22,249 B.	Portsm'th	Hawthorn	1900	..	735,011	4–2 K.S.	2–¾	4 K.S.	5 K.S.	5–4 N.S.	4 K.S.	14 *6-in.*, 8 *12-pr.*, 3 *3-pr.*, 8 M., 2 l.	..	22·5 *t*	800 / 16 0	500
a.c.	King Alfred	14,100	500	71	26	31,156	Barrow	Vickers	1901	..	1,013,772	6-5-4 K.S.	2½–1	..	5 K.S.	6–5 K.S.	5 K.S.	2 *9·2-in.*, 16 *6-in.*, 14 *12-pr.*, 3 *3-pr.*, 9 l.	2	23·46	1250	813
	Leviathan					31,592 B.	Clydeb'k	J. Brown			1,043,917									23·25 *t*	2500	
b. 1st cl.	King Edward VII.	16,350	425	78	26¾	18,000	Devonp'rt	Harland	Bldg.	..	1,426,266	9 K.S.	2–1	8 K.S.	12 K.S.	12–6 N.S.	..	4 *12-in.*, 4 *9·2-in.*, 10 *6-in.*, 24 small.	2	18·5	950	800
a.c.	Lancaster	9800	440	66	24½	22,000 B.	Elswick	Hawthorn	Bldg.	..	755,423	4–2 K.S.	2–¾	..	5 K.S.	5–4 N.S.	4 K.S.	14 *6-in.*, 10 *12-pr.*, 3 *3-pr.*, 9 M.	2	23·0	800 / 1600	500
b. 1st cl.	Jupiter	14,900	390	75	27½	12,000	Clydeb'nk	Thomson	1895	1897	966,856	9 H.S.	4–2½	..	14–9 H.S.	14–6 H.S.	6 K.S.	4 *12-in.*, 12 *6-in.*, 18 *12-pr.*, 12 *3-pr.*, 8	5	17·5	900 / 2200	757
b 1st cl.	Magnificent	14,900	390	75	27½	12,000	Chatham	Penn	1894	1895	982,391											
b. 1st cl.	Majestic	14,900	390	75	27½	12,000	Portsm'th	Barrow	1895	1895	983,732											
b 1st cl.	Mars	14,900	390	75	27½	12,000	Birkenh'd	Laird	1896	1897	961,581											
t. 3rd c.	Monarch	8930	330	57½	26½	8216	Chatham	Maudslay	1868	1869	†	7–6	..	..	5–4½	8	..	4 *12-in.* M.L.R., 2 *9-in.* do., 1 *7-in.* do., 4 *12-pr.*, 10 *3-pr.*, 6 M., 2 l.	2	15·0	630	598
a.c.	Monmouth	9800	440	66	24½	22,000 B.	Glasgow	London & Glasgow Shipbg.Co.	1901	..	700,655	4–2 K.S.	2–¾	4 K.S.	5 K.S.	5–4 N.S.	4 K.S.	14 *6-in.*, 8 *12-pr.*, 3 *3-pr.*, 8 M., 2 l.	..	23·0	800 / 1600	500
b. 1st cl.	Montagu	14,000	405	75½	26½	18,285 B.	Devonport	Laird	19 1	..	1,089,642	7 K.S.	2–1	1½	14 K.S.	11·6 N.S.	6 K.S.	4 *12-in.*, 12 *6-in.*, 12 *12-pr.*, 6 *3-pr.*, 2 M., 2 l.	4	18·8	900 / 2000	750
a.c.	Narcissus	5600	300	56	24½	8500	Hull	Earle	1886	1889	300,149	10 *comp.*	3–2	..	16 *comp.*	4½	..	2 *9·2-in.*, 10 *6-in.*, 6 *6-pr.*, 10 *3-pr.*, 6 M., 3 l.	4	18·1	750 / 900	484
b. 1st cl.	New Zealand	16,350	425	78	26¾	18,000	Portsm'th	Humphrys	Bldg.	..	*	9 K.S.	2–1	..	12 K.S.	12 N.S.	6 N.S.	4 *12-in.*, 4 *9·2-in.*, 10 *6-in.*, 24 small.	2	18·5	950	800
t. 1st cl.	Nile	11,940	345	73	27½	12,000	Pembroke	Maudslay	1888	1890	890,283	20–16 *comp.*	3	3	18–14 *comp.*	18 *comp.*	..	4 *13·5-in.*, 6 *6-in.*, 8 *6-pr.*, 12 *3-pr.*, 7 M., 3 l.	6 (2 sub.)	16·7 *t*	900 / 1200	558
b. 1st cl.	Ocean	12,950	390	74	25¾	13,500 B.	Devonport	Hawthorn	1898	1900	936,048	6 H.S.	..	2 K.S.	12 H.S.	12–5 H.S.	5 H.S.	4 *12-in.*, 12 *6-in.*, 10 *12-pr.*, 6 *3-pr.*, 8 M., 2 l.	5 (4 sub.)	18·25	800 / 1850	700
a.c.	Orlando	5600	300	56	24¾	8500	Jarrow	Palmer	1886	1888	303,065	10 *comp.*	3–2	..	16 *comp.*	4½ *comp.*	..	2 *9·2-in.*, 10 *6-in.*, 6 *6-pr.*, 10 *3-pr.*, 7 M., 3 l.	2	18·1	750	484
b. 1st cl.	Prince George	14,900	390	75	27½	12,000	Portsm'th	Humphrys	1895	1896	971,444	9 H.S.	4–2½	..	14–9 H.S.	14–6 H.S.	6	4 *12-in.*, 12 *6-in.*, 18 *12-pr.*, 12 *3-pr.*, 2 l.	5 (4 sub.)	17·5	900 / 2200	757
b. 1st cl.	Prince of Wales	15,000	400	75	26¾	15,000 B.	Chatham	Greenock Foundry	1902	..	1,195,375	9 K.S.	2–1	3	12 K.S.	12–6 N.S.	6–2 K.S.	4 *12-in.*, 12 *6-in.*, 16 *12-pr.*, 6 *3-pr.*, 8 M., 2 l.	4	18	900	755
b. 1st cl.	Queen	15,000	400	75	26¾	15,000 B. & W.	Devonport	Harland & Wolff	1902	..	1,123,532											
b. 1st cl.	Renown . shd.	12,350	380	72	26¾	12,000	Pembroke	Maudslay	1895	1896	746,247	8–6 H.S.	3–2	..	10–6 H.S.	10 H.S.	6–2	4 *10-in.*, 10 *6-in.*, 12 *12-pr.*, 12 *3-pr.*, 8 M., 2 l.	5 (2 sub.)	18·0	900 / 1450	674
b. 1st cl.	Ramillies	14,000	380	75	27½	13,000	Glasgow	Thomson	1892	1893	952,550	18–5 *comp.*	3	5–4 N.S.	16 *comp.*	17 *comp.*	6–2 K.N.C.	4 *13·5-in.*, 10 *6-in.*, 16 *6-pr.*, 12 *3-pr.*, 8 M., 2 l.	7 (2 sub.)	17·5	900 / 1450	730
b 1st cl.	Repulse	14,000	380	75	27½	13,000	Pembroke	Humphrys	1892	1894	907,848											
b. 1st cl.	Resolution	14,000	380	75	27½	13,000	Jarrow	Palmer	1892	1893	929,267											

* Details of cost incomplete.

GREAT BRITAIN.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Second-ary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.	in.	in.	in.	in.			knots.	tons.	
1st cl.	Revenge .	14,000	380	75	27½	13,000	Jarrow	Palmer	1892	1895	927,386											
b. 1st cl.	Royal Oak .	14,000	380	75	27½	13,000	Birkenh'd	Laird	1892	1894	1,014,943	18–5 comp.	3	5–4 N.S.	16 comp.	17 comp.	6–2 K.N.C.	4 *13·5-in.*, 10 *6-in.*, 16 *6-pr.*, 12 *3-pr.*, 8 M., 2 l.	7 (2 sub.)	17·5	900 / 1800	730
b. 1st cl.	RoyalSovereign	14,000	380	75	27½	13,312	Portsm'th	Humphrys	1891	1892	..											
b. 1st cl.	Rodney .	10,300	325	68	27¼	11,500	Chatham	Humphrys	1884	1888	824,652	18 comp.	3–2½	..	16 comp.	11 comp.	..	4 *13·5-in.*, 6 *6-in.*, 12 *6-pr.*, 10 *3-pr.*, 6 M., 2 l.	4	16·75	900 / 1200	515
a.c.	Roxburgh .	10,700	450	68½	25	22,000 D. & cyl.	London & Glasgow	London & Glasgow Company	Bldg.	..	764,531	6–2 K.S.	2–¾	..	4½ K.S.	6 N.S.	6	2 *7·5-in.*, 10 *6-in.*, 10 *12-pr.*, 3 *3-pr.*	2	22·25	800 / 1600	655
b. 1st cl.	Russell .	14,000	405	75½	26½	18,229 B.	Jarrow	Palmer	1901	..	1,098,717	7 K.S.	2–1	1½ K.S.	14 K.S.	11–6 K.S.	6 K.S.	4 *12-in.*, 12 *6-in.*, 12 *12-pr.*, 6 *3-pr.*	4	19·3 *t*	900 / 2000	750
1st cl.	Sans Pareil	10,470	340	70	27¼	14,000	Blackwall	Humphrys	1887	1889	850,525	16–18 comp.	3	..	16 comp.	18 comp.	9·5	2 *16·25-in.*, 1 *10-in.*, 12 *6-in.*, 12 *6-pr.*, 12 *3-pr.*, 8 M., 2 l.	6 (2 sub.)	17·2 *t*	900 / 1200	583
a.c.	Suffolk .	9800	440	66	24½	22,000 Nic.	Portsm'th	Humphrys	1903	..	776,566	4–2 K.S.	2–¾	4 K.S.	5 K.S.	5–4 N.S.	4 K.S.	14 *6-in.*, 10 *12-pr.*, 3 *3-pr.*, 9 M.	2	23·0	800 / 1600	500
a.c.	Sutlej . shd.	12,000	440	69½	26¼	21,000 B.	Clydeb'nk	Clydebank Company	1899	1902	790,706	6 K.S.	3–2	2	5 K.S.	6 K.S.	..	2 *9·2-in.*, 12 *6-in.*, 12 *12-pr.*, 3 *3-pr.*, 8 M., 2 l.	2	21·0	800 / 1600	755
t. 2nd c.	Thunderer .	9330	285	62½	27	7000	Pembroke	Maudslay	1872	1877	873,038	12–10	3–2	..	12–10	14–12	..	4 *10-in.*, 6 *6-pr.*, 8 *3-pr.*, 4 M., 2 l.	2	14·0	1600	592
t. 1st cl.	Trafalgar .	11,940	345	73	27½	12,000	Portsm'th	Humphrys	1887	1890	..	20–16 comp.	3	3	18–14 comp.	18 comp.	..	4 *13·5-in.*, 6 *6-in.*, 8 *6-pr.*, 12 *3-pr.*, 6 M., 3 l.	6 (2 sub.)	16·7 *t*	900 / 1200	572
a.c.	Undaunted .	5600	300	56	22½	8500	Jarrow	Palmer	1886	1889	300,863	10 comp.	3–2	..	16 comp.	4½ comp.	..	2 *9·2-in.*, 10 *6-in.*, 6 *6-pr.*, 10 *3-pr.*, 7 M., 3 l.	4	18·1	750 / 900	484
b. 1st cl.	Victorious .	14,900	390	75	27½	12,000	Chatham	Hawthorn	1895	1897	961,783	9 H.S.	3–2½	..	14–9 H.S.	14–6 H.S.	6	4 *12-in.*, 12 *6-in.*, 18 *12-pr.*, 12 *3-pr.*, 8 M., 2 l.	5 (4 sub.)	17·5	900 / 2200	757
b. 1st cl.	Venerable .	15,000	400	75	26¾	15,345 B.	Chatham	Maudslay	1899	1902	1,153,974	7 K.S.	4–2½	3	14 K.S.	11–6 K.S.	6–2	4 *12-in.*, 12 *6-in.*, 16 *12-pr.*, 6 *3-pr.*, 8 M., 2 l.	2	18·3 *t*	900 / 2000	755
b. 1st cl.	Vengeance .	12,950	390	74	26	13,500 B.	Barrow	Vickers	1899	1901	880,872	6 H.N.S.	2–1	..	12 H.N.S.	12–6 H.S.	5 H.S.	4 *12-in.*, 12 *6-in.*, 12 *12-pr.*, 6 *3-pr.*, 8 M.	4	18·5	800 / 1850	750
a.c.	Warspite .	8400	315	62	27¼	10,000	Chatham	Penn	1884	1888	653,072	10 comp.	3–2	..	9 comp.	8 comp.	..	4 *9·2-in.*, 10 *6-in.*, 4 *6-pr.*, 9 *3-pr.*, 6 M., 2 l.	6	16·7	900 / 1130	535

3 new battleships, Programme 1903–4, improved King Edward VII. class.

4 new armoured cruisers, Programme 1903-4, Duke of Edinburgh class; one to be built at Pembroke, three by contract.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
Scout	Adventure*	2750	370	38	13¼	16,000 Y mod.	Armstr'ng	Hawthorn.	Bldg.	..	Details incomplete	1½–⅝	..	10 12-pr.	2	25	150 / 380	268
2nd cl. Cr.	Æolus . shd.	3600	300	43	17½	9000	Devonp'rt	Hawthorn.	1892	1893	218,246	2–1	2	2 6-in., 6 4·7-in., 8 6-pr., 1 3-pr., 4 M., 1 l.	4	19·75	400 / 535	273
Dsp. Ves.	Alacrity	1700	250	32½	14	3000	Jarrow	Palmer	1885	1887	85,518	..	..	10 6-pr., 2 M.	..	17·00	400	114
T. G. B.	Alarm	810	230	27	8¾	3884	Sheerness	Penn	1892	1893	64,349	..	2	2 4·7-in., 4 3-pr.	3	19·25	100	91
2nd cl. G. B.	Albacore	560	135	26	10½	500	Birkenh'd	Laird	1883	1884	..	..	..	2 5-in., 2 4-in., 2 M.	..	11·0	85	59
Sloop	Alert . shd.	960	180	32½	11½	1400	Sheerness	Sheerness	1894	1896	64,889	..	..	6 4-in., 25-pr., 4 3-pr., 2 M.	..	13·25	130	101
"	Algerine	1050	185	32½	11½	1400	Devonp'rt	Devonport.	1895	1896	68,604	..	0·22	6 4-in., 25-pr., 4 3-pr., 3 M.	..	13·0	160	106
3rd cl. Cr.	Amethyst	3000	360	40	14½	9800 Y mod.	Armstr'ng	Parsons' Turbine	Bldg.	..	222,106	..	..	12 4-in., 8 3-pr.	..	21·75	300	..
2nd cl. Cr.	Amphion	4300	300	46	20½	5000	Pembroke	Maudslay.	1883	1886	..	1½	..	10 6-in., 4 3-pr., 10 M., 2 l.	4	16·6	550 / 1000	309
" "	Andromache	3400	300	43	16½	9000	Chatham.	Earle	1890	1892	195,965	2–1	2	2 6-in., 6 4·7-in., 8 6-pr., 1 3-pr., 4 M., 1 l.	4	20·0	400	273
" "	Apollo	3400	300	43	16½	9000	Chatham.	Earle	1891	1892	195,646							
1st cl. Cr.	Andromeda shd.	11,000	435	69	25¼	16,500 B.	Pembroke	Hawthorn.	1897	1900	601,356	3–6	3	16 6-in., 12 12-pr., 4 3-pr., 2 l., 8 M.	3	20·5	1000	600
T. G. B.	Antelope	810	230	27	8¾	3621	Devonp'rt	Yarrow	1893	1894	68,939	..	2	2 4·7-in., 4 3-pr.	3	19·25	100	91
3rd cl. Cr.	Archer	1770	225	36	14½	3500	Glasgow	Thomson	1885	1888	97,449	..	..	6 6-in., 8 3-pr., 2 M., 1 l.	3	16·5	475	172
1st cl. Cr.	Argonaut . shd.	11,000	435	69	25¼	18,000 B.	Fairfield	Fairfield	1898	1900	573,704							
" "	Ariadne . shd.	11,000	435	69	25¼	18,000 B.	Clydeb'nk	JohnBrown	1898	1900	565,464	4	3–6 H. S.	16 6-in., 14 12-pr., 3 3-pr., 8 M.	3 (2 sub.)	20·75	1000	677
" "	Amphitrite shd.	11,000	435	69	25¼	18,000 B.	Barrow	Vickers	1898	1900	575,300							
3rd cl. Cr.	Arethusa	4300	300	46	20½	5000	Glasgow	Napier	1882	1887	189,340	1½	..	10 6-in., 8 3-pr., 6 M., 2 l.	4	16·6	500 / 1000	309
2nd cl. Cr.	Arrogant	5800	320	57½	21	10,000 B.	Devonp'rt	Earle	1896	1898	..	1–2 N. S.	3 N. S.	10 6-in., 9 12-pr., 3 3-pr., 1 l., 5 M.	2	19·1	500	480
3rd cl. Cr.	Astræa . shd.	4360	320	49½	19	9112	Devonp'rt	Devonport	1893	1894	265,745	2–1	2	2 6-in., 8 4·7-in., 8 6-pr., 1 3-pr., 4 M., 1 l.	4	19·75	400	312
" "	Barham	1830	280	35	13¼	4700 T.	Portsm'th	Hawthorn.	1889	1890	120,107	2–1	2	6 4·7-in., 4 3-pr., 2 M.	2	18·6	140	169
" "	Bellona	1830	280	35	13¼	4700 T.	Newcastle	Hawthorn.	1890	1891	99,274	2–1	2	6 4·7-in., 4 3-pr., 2 M.	2	17·8	140	169
" "	Barracouta	1580	220	35	14	3000	Sheerness	Palmer	1889	1890	101,690							
" "	Barrosa	1580	220	35	14	3000	Portsm'th	Palmer	1889	1890	91,577							
" "	Blanche . shd.	1580	220	35	14	3000 L.	Pembroke	Laird	1889	1891	97,524	2–1	2	6 4·7-in., 4 3-pr., 3 M.	2	16·5	160	159
" "	Blonde . shd.	1580	220	35	14	3000 L.	Pembroke	Laird	1889	1891 1902	97,406							
Sloop	Basilisk . shd.	1170	195	28	12½	2000	Sheerness	Rennie	1889	1890	72,565							
"	Beagle . shd.	1170	195	28	12½	2000	Portsm'th	Rennie	1889	1890	67,632	..	..	8 5-in., 8 M.	..	14·7	160	138
1st cl. Cr.	Blake	9000	375	65	25¾	20,000	Chatham.	Maudslay.	1889	1892	461,483							
" "	Blenheim	9000	375	65	25¾	21,411	Blackwall	Humphrys	1890	1893	453,930	6–3	6	2 9·2-in., 10 6-in., 16 3-pr., 7 M., 2 l.	4	21·5	1500	570

* These particulars are subject to modifications.

GREAT BRITAIN.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
3rd cl. Cr.	Bonaventure shd.	4360	320	49½	19	9000	Devonp'rt	Hawthorn	1892	1894	258,974	2–1	2	2 *6-in.*, 8 *4·7-in.*, 8 *6-pr.*, 1 *3-pr.*, 4 M., 1 l.	4	19·5	400	312
T. G. B.	Boomerang (Australia)	735	230	27	8¼	3500	Elswick	Bellis	1889	1891	52,076	..	2	2 *4·7-in.*, 4 *3-pr.*, 1 M.	3	20·0	100	91
3rd cl. Cr.	Brilliant shd.	3600	300	43¾	17½	9164	Sheerness	Hawthorn	1891	1893	219,852	2–1	2	2 *6-in.*, 6 *4·7-in.*, 8 *6-pr.*, 1 *3-pr.*, 4 M., 1 l.	4	19·7	400	273
3rd cl. Cr.	Brisk	1770	225	36	14¼	3500	Glasgow	Thomson	1886	1888	100,577	..	..	6 *6-in.* Q.F.C., 8 *3-pr.*, 2 M., 1 l.	3	16·5	325	172
1st cl. G. B.	Bramble	700	180	33	8	1300 Y.	Liverpool	Fawcett & Co.	1898	1901	53,652	..	..	2 *4-in.*, 4 *12-pr.*	..	13·5	50	85
,, ,,	Britomart	700	180	33	8	1300 Y.	Liverpool	Fawcett & Co.	1898	1901	53,634	..	..	2 *4-in.*, 4 *12-pr.*	..	13·5	50	85
Sloop	Cadmus shd. / Clio shd.	1070	185	33	11¼	1400	Sheerness	J. S. White & Co., Sheerness	Bldg.	Bldg.	87,697 / 94,002	..	..	6 *4-in.* and 4 *3-pr.*	..	13·0 to 13·25	160	150
Sloop	Buzzard	1140	195	28	11½	2000	Sheerness	Barrow	1887	1888	85,214	..	..	8 *5-in.*, 8 M.	2	14·50	160	138
3rd cl. Cr.	Calliope shd.	2770	235	44½	20	4020	Portsm'th	Rennie	1884	1886	..	1½	..	4 *6-in.*, 12 *5-in. 38 cwt.*, 9 M., 2 l.	2	14·6	550	293
,, ,,	Calypso shd.	2770	235	44½	20	4000	Chatham	Rennie	1883	1886	..							
3rd cl. Cr.	Cambrian shd.	4360	320	49½	19	9000	Pembroke	Hawthorn	1893	1894	248,883	2–1	2	2 *6-in.*, 8 *4·7-in.*, 8 *6-pr.*, 1 *3-pr.*, 4 M., 1 l.	4	19·5	400	312
2nd cl. Cr.	Challenger	5880	355	56	21¼	12,500 B.&W.	Chatham	Wallsend Eng'ng Co.	1902	Bldg.	407,775	..	..	11 *6-in.*, 9 *12-pr.*, 6 *3-pr.*	..	20·75 to 21·0	500	..
3rd cl. Cr.	Champion shd.	2380	225	44½	19¼	2000	Glasgow (Fairfield)	Elder	1878	1880	..	1½	..	4 *6-in.*, 8 *5-in.*, 4 *3-pr.*, 6 M., 2 l.	2	12·75	470	265
3rd cl. Cr.	Cleopatra shd.	2380	225	44½	19¼	2000	Glasgow (Fairfield)	Humphrys	1878	1881	..	1½	..	4 *6-in.*, 8 *5-in.*, 4 *3-pr.*, 6 M., 2 l.	2	13·0	470	265
,, ,,	Comus shd.	2380	225	44½	19¼	2000	Glasgow (Fairfield)	Elder	1878	1880	..	1½	..	10 *6-in.*, 7 M., 2 l.	2	12·75	470	265
,, ,,	Cordelia shd.	2380	225	44½	19¼	2000	Portsm'th	Rennie	1881	1883	..	1½	..	10 *6-in.*, 9 M., 2 l.	2	12·75	470	265
3rd cl. Cr.	Charybdis shd.	4360	320	49½	19	9000	Sheerness	Earle	1893	1895	253,135	2–1	2	2 *6-in.*, 8 *4·7-in.*, 8 *6-pr.*, 1 *3-pr.*, 4 M., 1 l.	4	19·5	400	312
T. G. B	Circe *	810	230	27	8¾	3500 F.	Sheerness	Penn	1892	1893	64,122	..	2	2 *4·7-in.*, 4 *3-pr.*	3	19·25	100	91
2nd cl. G.B.	Cockchafer	465	125	23½	9½	360	Pembroke	Maudslay	1881	1883	..	..	..	2 *64-pr.* M.L.R., 2 *20-pr.*, 2 M.	..	9·8	40	61
3rd cl. Cr.	Cossack	1770	225	36	14¼	3500	Glasgow	Thomson	1886	1889	99,027	..	..	6 *6-in.*, 8 *3-pr.*, 2 M., 1 l.	3	16·5	325	172
1st cl. Cr.	Crescent shd.	7700	360	60	23¾	12,000	Portsm'th	Penn	1892	1894	411,108	5–1	6	1 *9·2-in.*, 12 *6-in.*, 12 *6-pr.*, 5 *3-pr.*, 7 M., 2 l.	4 (2 sub.)	19·7	850	560
3rd cl. Cr.	Curaçoa shd.	2380	225	44½	19¼	2000	Glasgow (Fairfield)	Humphrys	1878	1880	..	1½	..	4 *6-in.*, 8 *5-in.*, 1 *3-pr.*, 9 M., 2 l.	2	13·0	470	265
G. V.	Curlew	950	195	28	10½	1200	Devonp'rt	Penn	1885	1887	..	..	..	1 *6-in.*, 3 *5-in.*, 7 M.	1	14·5	250	103
Sloop	Daphne	1140	195	28	11½	2000	Sheerness	Greenock F'ndry Co.	1888	1889	73,404	..	..	8 *5-in.*, 8 M.	..	14·0	160	138
1st cl. Cr.	Diadem † shd.	11,000	435	69	26	16,500 B.	(Fairfield)	Fairfield	1896	1899	582,662	4–2½	4½–2	16 *6-in.*, 14 *12-pr.*, 4 *3-pr.*, 8 M.	3 (2 sub.)	20·5	1000	357
3rd cl. Cr.	Diamond	3000	360	40	14½	9800 L.N.	Laird	Laird	Bldg.	..	Details not complete	..	..	12 *4-in.*, 8 *3-pr.*	..	21·75	300	..
2nd cl. Cr.	Diana shd.	5600	350	54	21	9600	(Fairfield)	Fairfield	1895	1898	269,639							
,, ,,	Dido shd.	5600	350	54	21	9600	Glasgow	London and Glasgow Co.	1896	1898	268,188	2½	3	11 *6-in.*, 9 *12-pr.*, 7 *3-pr.*, 5 M., 1 l.	3 (2 sub.)	19·5	550	470
,, ,,	Doris shd.	5600	350	54	21	9600	Barrow	Barrow	1896	1898	270,823							
T. G. B.	Dryad	1670	250	30½	9	3500	Chatham	Maudslay	1893	1894	75,921	..	2	2 *4·7-in.*, 4 *6-pr.*	3	19·0	100	120

* Being re-engined and reboilered with small tube water-tube boilers.

† Under repair at Fairfield.

GREAT BRITAIN.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Makers of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
1st cl. G. B.	Dwarf	700	180	33	8	1300 Y.	Glasgow	London and Glasgow Co.	1898	1900	54,369	..	..	2 4-*in.*, 4 12-*pr.*	..	13·5	50	85
2nd cl. Cr.	Eclipse . shd.	5600	350	53	20¼	9600	Portsm'th	Portsm'th	1894	1897	292,745	1½–3	3	11 6-*in.*, 8 12-*pr.*, 6 3-*pr.*, 5 M., 1 l.	3	19·5	550	477
1st cl. Cr.	Edgar	7350	360	60	23¾	12,000	Devonp'rt	Fairfield	1890	1893	428,081	5–1	6	2 9·2-*in.*, 10 6-*in.*, 12 6-*pr.*, 5 3-*pr.*, 7 M., 2 l.	4	20·5	850	544
2nd cl. Cr.	Encounter	5880	355	56	21½	12,500 Durr	Devonp'rt	Keyham	Bldg.	Bldg.	431,917	..	..	11 6-*in.*, 9 12-*pr.*, 6 3-*pr.*	..	20·75 to 21·0	600	..
1st cl. Cr.	Endymion	7350	360	60	23¾	12,000	Hull	Earle	1891	1894	397,973	5–1	6	2 9·2-*in.*, 10 6-*in.*, 12 6-*pr.*, 5 3-*pr.*, 7 M., 2 l.	4	20 5	850	544
Sloop	Egeria	940	160	31½	14¼	700	Pembroke	Humphrys	1873	1875	..	..	..	4 20-*pr.*, 2 M., 1 l.	..	11·3	100	122
"	Espiègle . shd.	1070	185	33	11¼	1400 B.&W.	Sheerness	Wallsend Slipway Co.	Bldg.	1902	80,459	..	..	6 4-*in.*, 4 3-*pr.*	..	13·5	160	160
1st cl. Cr.	Europa . shd.	11,000	435	69	26	16,500 B.	Clydeb'nk	Thomson	1897	1899	589,835	4–2½	4½–2	16 6-*in.*, 14 12-*pr.*, 4 3-*pr.*, 8 M.	3	20·5	1000	357
Sloop	Fantôme . shd.	1070	185	33	11¼	1400 Nic.	Sheerness	Devonport	1902	1902	93,975	..	..	6 4-*in.*, 4 3-*pr.*	..	13·5	160	160
3rd cl. Cr.	Fearless	1580	220	34½	14½	3200	Barrow	Barrow	1886	1888	92,103	..	..	4 4·7-*in.*, 8 3-*pr.*, 2 M., 1 l.	3	16·7	450	147
2nd cl. G. B.	Firebrand	455	125	23½	10	360	Glasgow	Thomson	1877	1879	..	..	..	2 5-*in.*, 2 4-*in.*, 2 M.	..	10·17	40	61
3rd cl. Cr.	Flora . shd.	4360	320	49½	19	9000	Pembroke	Barrow	1893	1895	253,783							
" "	Forte . shd.	4360	320	49½	19	9000	Chatham	Chatham	1893	1895	252,780	2–1	2	2 6-*in.*, 8 4·7-*in.*, 8 6-*pr.*, 1 3-*pr.*, 4 M., 1 l.	4	19·5	400	312
" "	Fox . shd.	4360	320	49½	19	9000	Portsm'th	Portsm'th	1893	1895	256,012							
" "	Forth	4050	300	46	20	5700	Pembroke	Hawthorn	1886	1889	247,720	3–2	2	2 8-*in.*, 10 6-*in.*, 3 6-*pr.*, 8 3-*pr.*, 6 M, 2 l.	2	16·8	900	326

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Makers of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
Scout	Forward*	2545	360	38½	13	16,000 F.	Fairfield	Fairfield	Bldg.	..	Details not complete	1½–⅝	..	10 12-*pr.*	2	25	165/380	268
2nd cl. Cr.	Furious . shd.	5750	320	57½	21	10,000 B.	Devonp'rt	Earle	1896	1899	288,830	1–2	3	10 6-*in.*, 9 12-*pr.*, 3 3-*pr.*, 5 M., 1 l.	2	19·0	500	480
" "	Gladiator . shd.					10,000 B.	Portsm'th	Maudslay	1896	1900	300,612							
1st cl. Cr.	Gibraltar . shd.	7700	360	60	23¾	12,000	Glasgow	Napier	1892	1894	377,741	5–1	6	2 9·2-*in.*, 10 6-*in.*, 12 6-*pr.*, 5 3-*pr.*, 7 M., 2 l.	4	19·7	850	544
T. G. B.	Gleaner	735	230	27	8¼	3600	Sheerness	Sheerness	1890	1892	65,912	..	2	2 4·7 *in.*, 4 3-*pr.*	3	20·3 *t*	100	91
"	Gossamer	735	230	27	8½	6058 R.	Sheerness	Sheerness	1890	1891 1902	65,273	..						
1st cl. G. B.	Goldfinch	805	165	31	11½	1200	Sheerness	Sheerness	1889	1890	49,060	5–1	..	6 4-*in.*, 2 3-*pr.*, 2 M.	..	13·0	105	76
1st cl. Cr.	Grafton	7350	360	60	23¾	12,000	Blackwall	Humphrys	1892	1894	381,958	..	6	2 9·2-*in.*, 10 6-*in.*, 12 6-*pr.*, 5 3-*pr.*, 7 M., 2 l.	4	20·0	850	560
T. G. B.	Grasshopper	525	200	23	8¾	2700	Sheerness	Maudslay	1887	1888	47,750	..	..	1 4-*in.*, 6 3-*pr.*	4	17·0	80	67
"	Halcyon†	1070	250	30½	9	3500	Devonp'rt	Hawthorn	1894	1895	77,521	..	2	2 4·7-*in.*, 4 6-*pr.*	3	19·0	100	120
"	Harrier	1070	250	30½	9	3500	Devonp'rt	Hawthorn	1894	1895	75,858	..						
1st cl. Cr.	Hawke	7350	360	60	23¾	12,000	Chatham	Fairfield	1891	1893	413,101	5–1	6	2 9·2 *in.*, 10 6-*in.*, 12 6-*pr.*, 5 3-*pr.*, 7 M., 2 l.	4	20·0	850	544
T. G. B.	Hazard	1070	250	30½	9	3500	Pembroke	Fairfield	1894	1894	76,506	..	2	2 4·7-*in.*, 4 6-*pr.*	3	19·0	100	120
"	Hebe	810	230	27	8¾	3566	Sheerness	Sheerness	1892	1894	75,630	..	2	2 4·7-*in.*, 4 3-*pr.*	3	19·25	100	91
T. D. S.	Hecla	6400	391½	38¾	24¼	2400	Belfast	Harland & Wolff	1878	1879	..	..	..	4 7·5-*in.*, 14 M.	4	13·0	2200	277
2nd cl. Cr.	Hermes‡ . shd.	5600	350	54	20½	10,000 B.&W.	Fairfield	Fairfield	1898	1900 1902	300,593							
" "	Highflyer . shd.	5600	350	54	20½	10,000 B.	Fairfield	Fairfield	1898	1900	298,863	1½–3	3	11 6-*in.*, 9 12-*pr.*, 6 3-*pr.*, 6 M.	..	20·0	600	477
" "	Hyacinth . shd.	5600	350	54	20½	10,000 B.	Glasgow	London and Glasgow Co.	1898	1901	304,139							
3rd cl. Cr.	Hermione shd.	4360	320	49½	19	9000	Devonp'rt	Thomson	1893	1895	235,231	2–1	2	2 6-*in.*, 8 4·7-*in.*, 8 6-*pr.*, 1 3-*pr.*, 4 M., 1 l.	4	19·5	400	312

* These particulars are subject to modification. † Under repair by contract. ‡ Reboilered at Harland & Wolff's, Belfast.

GREAT BRITAIN.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
T. G. B.	Hussar	1070	250	30½	9	3500	Devonp'rt	Hawthorn	1894	1895	75,316	..	2	2 4·7-*in.*, 4 6-*pr.*	3	19·0	100	120
Sloop	Icarus	970	167	32	13½	1200	Devonp'rt	Barrow	1885	1887	..	..	..	8 5-*in.*, 4 3-*pr.*, 4 M., 1 l.	..	12·2	150	126
3rd cl. Cr.	Indefatigable shd.	3600	300	43¾	17½	9000	Glasgow	London and Glasgow Co.	1891	1892	190,309							
" "	Intrepid shd.	3600	300	43¾	17½	9000	Glasgow	London and Glasgow Co.	1891	1893	190,452	2–1	2	2 6-*in.*, 6 4·7-*in*, 8 6-*pr.*, 1 3-*pr.*, 1 M., 1 l	4	19·75	400	273
" "	Iphigenia shd	3600	300	43¾	17½	9000	Glasgow	London and Glasgow Co.	1891	1893	190,965							
" "	Iris	3730	300	46	22	6000	Pembroke	Maudslay	1877	1880	..	..	..	13 5-*in*, 4 3-*pr.*, 8 M., 1 l.	3	18·0	780	450
" "	Isis shd.	5600	350	54	21	9600	Glasgow	London and Glasgow Co.	1896	1898	268,725	2½	3	11 6-*in*, 9 12-*pr.*, 7 3-*pr.*, 5 M., 1 l.	4 (2 sub.)	20·0	550	470
" "	Juno shd.	5600	350	54	21	9600	Barrow	Barrow	1895	1898	270,993							
T. G. B.	Jaseur	810	230	27	8¾	3711	Barrow	Barrow	1892	1894	50,425	..	2	2 4·7-*in.*, 4 3-*pr.*	3	19·25	100	91
"	Jason	810	230	27	8¾	3540 R.	Barrow	Barrow	1892 1902	1893	51,369							
"	Karrakatta (Australia)	735	230	27	8¼	3500	Elswick	Bellis	1890	1891	51,949	..	2	2 4·7-*in.*, 4 3-*pr.*	3	20·0	100	91
3rd cl. Cr.	Katoomba (Australia)	2575	265	41	15½	7500	Elswick	Hawthorn	1889	1891	124,316	2	2–1	8 4·7-*in.*, 8 3-*pr.*, 4 M., 1 l.	4	19·0	300	217
G. V.	Landrail	950	195	28	10½	1200	Devonp'rt	Penn	1886	1887	..	..	..	1 6-*in.*, 3 5-*in.*, 4 3-*pr.*, 3 M.	..	14·5	250	46
1st cl. G.B.	Lapwing	805	165	31	11½	1200	Devonp'rt	Devonport	1889	1890	50,635	..	..	6 4-*in.*, 25-*cwt.*, 2 3-*pr.*, 2 M.	..	13·0	105	76
3rd cl. Cr.	Latona	3400	300	43	16½	9000	Barrow	Barrow	1890	1892	180,353	2	2–1	2 6-*in.*, 6 4·7-*in.*, 8 6-*pr.*, 1 3-*pr.*, 4 M., 1 l.	4	20·0	400	273
T. G. B.	Leda*	810	230	27	8¾	3597	Sheerness	Penn	1892	1894	64,332	2	..	2 4·7-*in.*, 4 3-*pr.*	3	19·25	100	91
G. V.	Linnet	756	165	29	11	870	Blackwall	Rennie	1880	1882	35,663	..	..	2 90-*cwt.* M.L.R., 4 6-*pr.*, 2 M.	..	11·80	180	92
1st cl. G.B.	Lizard	715	165	29	11¾	1000	Belfast	Harland	1886	1882	55,131	..	..	6 4-*in.*, 4 M.	..	13·0	105	76
3rd cl. Crs.	Magicienne shd. / Marathon shd.	2950	265	42	17½	9000	Glasgow (Fairfield)	Hawthorn	1888	1890	149,801 / 149,972	..	1½	6 6-*in.*, 9 6-*pr.*, 1 3-*pr.*, 3 M., 1 l.	4	19·0	400	218
1st cl. G.B.	Magpie	805	165	31	11½	1200	Pembroke	Earle	1889	1890	45,678	..	..	6 4-*in.*, 4 M.	..	13·0	105	76
3rd cl. Crs.	Medea / Medusa	2800	265	41	16½	9000 Y. / 9000 Dürr	Chatham	Humphrys	1888	1889 / 1902	171,874 / 171,099	..	1½	6 6-*in.*, 9 6-*pr.*, 1 3-*pr.*, 3 M., 1 l.	4	19·0	400	218
3rd cl. Cr.	Melampus	3400	300	43	16½	9000	Barrow	Barrow	1890	1892	180,920	2	2–1	2 6-*in.*, 6 4·7-*in.*, 8 6-*pr.*, 1 3-*pr.*, 4 M., 1 l.	4	20·0	400	273
Sloop	Melita	970	167	32	13½	1200	Malta	Malta Dock Yard	1888	1889	80,729	..	..	8 5-*in.*, 8 M., 1 l.	..	12·50	150	125
3rd cl. Cr.	Melpomene shd.	2950	265	41	17½	9000	Portsm'th	Palmer Co.	1888	1890	173,872	..	1½	6 6-*in.*, 9 6-*pr.*, 1 3-*pr.*, 3 M., 1 l.	4	19·0	400	218
3rd cl. Cr.	Mercury	3730	300	46	20¼	6000	Pembroke	Maudslay	1878	1884	..	..	..	13 5-*in.*, 4 3-*pr.*, 9 l.	4	16·8	780	291
Sloop	Merlin shd.	1070	185	33	11¼	1400 B.	Sheerness	Devonport	1901	1902	95,788	..	..	6 4-*in.*, 4 3-*pr.*	..	13·25	160	160

* Being re-engined and reboilered with small tube water-tube boilers.

GREAT BRITAIN.—Cruising Ships, &c.—*continued.*

Class	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
												Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
2nd cl. Cr.	**Mersey**	4050	300	46	19½	6000	Chatham.	Humphrys.	1885	1888	..	3–2	4	2 *8-in.*, 10 *6-in.*, 9 f.c., 3 *6-pr.*, 8 *3-pr.*, 5 M., 2 l.	4	17·3	900	327
3rd cl. Cr.	**Mildura** (Australia)	2575	265	41	15½	7500	Elswick	Hawthorn.	1889	1891	123,659	2–1	2	8 *4·7-in.*, 8 *3-pr.*, 4 M., 1 l.	4	19·0	300	217
2nd cl. Cr.	**Minerva** shd.	5600	350	53	20½	9600	Chatham.	Chatham	1895	1897	291,037	1½–3	3	11 *6-in.*, 9 *12-pr.*, 6 *3-pr.*, 5 M.	3 (2 sub.)	20·3	550	437
3rd cl. Cr.	**Mohawk**	1770	225	36	14½	3500	Glasgow	Thomson	1886	1888	97,731	..	..	6 *6-in.*, 8 *3-pr.*, 2 M., 1 l.	3	16·5	475	172
Sloop	**Mutine**	980	180	33	11½	1400 B.	Laird	Laird	1901	1902	67,243	..	..	6 *4-in.*, 4 *3-pr.*	..	13·25	130	130
3rd cl. Cr.	**Naiad**	3400	300	43	16½	9000	Barrow	Barrow	1890	1892	180,730	2–1	2	2 *6-in.*, 6 *4·7-in.*, 8 *6-pr.*, 1 *3-pr.*, 4 M., 1 l.	4	20·0	400	273
1st cl. Cr.	**Niobe** * shd.	11,000	435	69	26	16,500 B.	Barrow	Vickers	1897	1899	574,878	4–2½	4½–2	16 *6-in.*, 14 *12-pr.*, 4 *3-pr.*, 8 M.	3 (2 sub.)	20·5	1000	600
Sloop	**Nymphe**	1140	195	28	12½	2000	Portsm'th	Greenock F'ndry Co.	1888	1889	71,984	..	..	8 *5-in.*, 8 M.	..	14·0	160	138
T. G. B.	**Niger**	810	230	27	8¾	6282 R.	Barrow	Barrow	1892	1894	50,364	..	2	2 *4·7-in.*, 4 *3-pr.*	3	20·5 *t*	100	91
Sloop	**Odin** shd.	1070	185	33	11¼	1400 B & W	Sheerness	Devonport.	1902 1901	1902	86,627	..	..	6 *4-in.*, 4 *3-pr.*	..	13·25	160	160
T. G. B.	**Onyx**	810	230	27	8¾	3548	Birkenh'd	Laird	1892	1894	56,148	..	2	2 *4·7-in.*, 4 *3-pr.*	3	19·25	100	91
3rd cl. Cr.	**Pallas**	2575	265	41	15½	7610	Portsm'th	Hawthorn.	1890	1891	156,425	2–1	2	8 *4·7-in.*, 8 *3-pr.*, 4 M., 1 l.	4	19·25	300	217
" "	**Pearl**	2575	265	41	15½	7500	Pembroke	Earle	1888	1892	159,290							
Scout	**Pathfinder**	2500	360	38	13¼	17,000 L.N.	Birkenh'd	Laird	Bldg.	..	Details not complete	⅜–⅝	..	10 *12-pr.*	2	25	165/380	268
1st cl. G. B.	**Partridge**	755	165	30	11¼	1200	Devonp'rt	Devonport	1888	1889	50,121	..	..	6 *4-in.*, 4 M.	..	13·25	105	76
" "	**Peacock**	755	165	30	11¼	1200	Pembroke	Barrow Co.	1872	1889	45,552							

Class	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Deck.	Gun Position.	Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
3rd cl. Cr.	**Pactolus**	2135	300	36½	17	7000 Bl.	Elswick	Penn	1897	1899	145,770							
" "	**Pandora**	2200	305	36¾	13½	7000 T.	Portsm'th	Portsm'th	1900	1901	173,216							
" "	**Pegasus**	2135	300	36½	17	7000 R.	Jarrow	Palmer	1897	1899	141,252							
" "	**Pelorus**	2135	300	36½	17	7000 Nor.	Sheerness	Thomson	1896	1897	..							
" "	**Perseus**	2135	300	36½	13½	7000 T.	Hull	Earle	1898	1901	138,264							
" "	**Pioneer**	2200	305	36¾	13½	7000 T.	Chatham.	Fairfield	1899	1900	154,480	2	·22	8 *4-in.*, 8 *3-pr.*, 2 l.	2	20·0	250	224
" "	**Pomone**	2135	300	36½	13½	7000 Bl.	Sheerness	Penn	1897	1900	154,968							
" "	**Prometheus**	2135	300	36½	13½	7000 T.	Hull	Earle	1898	1901	135,916							
" "	**Psyche**	2200	305	36¾	17½	7000 T.	Devonp'rt	Devonport	1898	1900	160,963							
" "	**Proserpine**	2135	300	36½	17	7000 T.	Sheerness	Devonport	1896	1899	170,780							
" "	**Pyramus**	2135	300	36½	13½	7000 R.	Jarrow	Palmer	1898	1900	141,008							
Sloop (Surveying)	**Penguin**	1130	170	36	16	700	Glasgow	Hawthorn.	1876	1878	..	..	..	2 *64-pr.* M.L.R., 2 M., 1 l.	..	11·0	150	145
3rd cl. Cr.	**Phaeton**	4300	300	46	20½	5000	Glasgow	Napier	1883	1886	190,296	1½	..	10 *6-in.*, 4 *3-pr.*, 10 M., 2 l.	4	16·6	550/1000	309
1st cl. G. B.	**Pheasant**	755	165	29	11¼	1200	Devonp'rt	Devonport	1888	1889	50,121	..	..	6 *4-in.*, 4 M.	..	13·25	105	76
3rd cl. Cr.	**Philomel**	2575	265	41	15½	7500	Devonp'rt	Earle	1890	1892	163,699	2–1	2	8 *4·7-in.*, 8 *3-pr.*, 4 M., 1 l.	2	19·0	300	217
" "	**Phœbe**	2575	265	41	15½	7500	Devonp'rt	Devonport	1890	1892	168,751							
Sloop	**Phœnix** shd.	1050	185	32½	11¼	1400	Devonp'rt	Devonport	1895	1896	68,630	..	·22	6 *4-in.*, 4 *3-pr.*, 3 M.	..	13·0	160	106
1st cl. G. B.	**Pigeon**	755	165	30	11¼	1200	Pembroke	Barrow	1888	1889	45,528							
" "	**Pigmy**	755	165	30	11¼	1200	Sheerness	Barrow	1888	1889	48,773	..	..	6 *4-in.*, 4 M.	..	13·25	105	76
" "	**Plover**	755	165	30	11¼	1200	Pembroke	Barrow	1888	1889	45,345							
3rd cl. Cr.	**Pique** shd.	3600	300	43¾	17½	9000	Jarrow	Palmer	1890	1893	193,341	2–1	2	2 *6-in.*, 6 *4·7-in.*, 8 *6-pr.*, 1 *3-pr.*, 4 M., 1 l.	4	19·75	400	273
T. Ram	**Polyphemus**	2640	240	40	20	5500	Chatham.	Humphrys.	1881	1883	174,450	3–2	..	6 *6-pr.*, 2 M.	5	18·0	300	..

* Under repair at Barrow.

GREAT BRITAIN.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
3rd cl. Cr.	Porpoise	1770	225	36	14½	3500	Glasgow	Thomson	1886	1888	98,182	..	..	6 6-*in.* Q.F.C., 8 3-*pr.*, 2 M., 1 l.	3	16·5	475	172
1st cl. Cr.	Powerful. shd.	14,200	500	71	29	25,000 B.	Barrow	Barrow	1895	1898	741,870	3–6	6	2 9·2-*in.*, 16 6-*in.*, 18 12-*pr.*, 12 3-*pr.*, 9 M., 2 12-*pr.* boat.	4	22·1	1500 / 3000	840
3rd cl. Cr.	Pylades	1420	200	38	15¾	1400	Sheerness	Laird	1884	1886	..	1½	..	14 5-*in.*, 8 M., 1 l.	..	12·6	400	170
3rd cl. Cr.	Racoon	1770	225	36	13½	4500	Devonp'rt	Harland	1887	1888	120,507	..	..	6 6-*in.* Q.F.C., 8 3-*pr.*, 2 M., 1 l.	3	17·5	475	176
2nd cl. Cr.	Rainbow. shd	3600	300	43¾	17½	9681	Jarrow	Palmer	1891	1893	192,794	2–1	2	2 6-*in.*, 6 4·7-*in.*, 8 6-*pr.*, 1 3-*pr.*, 4 M., 1 l.	4	19·7	400	273
2nd cl. G. Ves. (Survey. Serv.)	Rambler	835	157	29½	13½	650	Glasgow (Fairfield)	Elder	1880	1881	..	..	..	2 20-*pr.*, 1 M., 1 l.	..	10·66	40	160
1st cl. G. B.	Rattler	715	165	29	11	1200	Elswick	Hawthorn.	1886	1888	41,343	..	..	6 4-*in.*, 4 M.	..	13·6	105	76
T. G. B.	Rattlesnake	550	200	23	8	2700	Birkenh'd	Laird	1886	1888	37,328	..	..	1 4-*in.*, 6 3-*pr.*	4	18·5	100	67
2nd cl. G. B.	Raven	465	125	23½	10	360	Poplar	Rennie	1882	1883	..	..	..	6 64-*pr.*, M.L.R., 2 20-*pr.* 2 M.	..	9·5	40	..
1st cl. G. B	Redbreast	805	165	31	11½	1200	Pembroke	Earle	1888	1890	45,630	..	..	6 4-*in.*, 4 M.	..	13·0	105	76
" "	Redpole										45,575							
2nd cl. G. B.	Redwing	461	125	23½	10	360	Pembroke	Maudslay	1880	1881	..	..	..	2 20-*cwt.*, 2 M.	..	9·68	40	..
T. G. B.	Renard	810	230	27	8¾	3500	Birkenh'd	Laird	1892	1894	56,035	..	2	2 4·7-*in.*, 4 3-*pr.*	3	19·25	100	91
3rd cl. Cr.	Retribution shd	3600	300	43¾	17½	9000	Jarrow	Palmer	1891	1893	192,761	2–1	2	2 6-*in.*, 6 4·7-*in.*, 8 6-*pr.*, 1 3-*pr.*, 4 M., 1 l.	4	19·75	400	275
Sloop	Rinaldo	980	180	33	11½	1400 B.	Laird	Laird	1901	1902	67,231	..	..	6 4-*in.*, 4 3-*pr.*	..	13·25	130	130
3rd cl. Cr.	Ringarooma (Australia)	2575	265	41	15½	7500	Glasgow	Thomson	1890	1891	135,673	2–1	2	8 4·7-*in.*, 8 3-*pr.*, 4 M., 1 l.	4	19·0	300	216
1st cl. G. B.	Ringdove	805	165	31½	11½	1200	Devonp'rt	Devonport	1889	1891	50,560	..	..	6 4-*in.*, 2 3-*pr.*, 2 M.	..	13·0	105	76
1st cl. Cr.	Royal Arthur shd.	7700	360	60	27¾	12,000	Portsm'th	Maudslay	1891	1893	427,620	5–1	6	1 9·2-*in.*, 12 6-*in.*, 12 6-*pr.*, 5 3-*pr.*, 7 M., 2 l.	4 (2 sub.)	19·7	850	567
Sloop	Rosario. shd.	980	180	33	11½	1400 B.	Sheerness	Governm't	1898	1900	81,662	..	..	6 4-*in.*, 4 3-*pr.*	..	13·25	130	130
3rd cl. Cr.	Royalist	1420	200	38	15¾	1400	Devonp'rt	Maudslay	1883	1885	..	1½	..	2 6-*in.*, 10 5-*in.*, 4 M., 1 l.	..	12·6	400	171
1st cl. Cr.	St. George. shd.	7700	360	60¾	23¾	12,000	Hull	Maudslay	1892	1894	407,540	5–1	6	2 9·2-*in.*, 10 6-*in.*, 12 6-*pr.*, 5 3-*pr.*, 7 M., 2 l.	4 (2 sub.)	19·7	850	559
T. G. B.	Salamander	735	230	27	8¼	3500 M.	Chatham	Maudslay	1889	1890	59,580	..	2	2 4·7-*in.*, 4 3-*pr.*	3	20·0	100	91
" "	Sandfly	525	200	23	8¾	2700	Devonp'rt	Maudslay	1887	1888	47,927	..	·22	1 4-*in.*, 6 3-*pr.*	4	19·0	80	67
3rd cl. Cr.	Sapphire	3000	360	40	14½	9800	Palmer	Palmer	Bldg.	..	Details not complete.	..	..	12 4-*in.*, 8 3-*pr.*	..	21·75	300	..
" "	Sappho	3400	300	43	16½	9861	Poplar	Penn	1891	1893	181,369	2–1	2	2 6-*in.*, 6 4·7-*in.*, 8 6-*pr.*, 1 3-*pr.*, 4 M., 1 l.	4	20·47	400	273
" "	Scout.	1580	220	34	14½	3200	Glasgow	Thomson	1885	1887	97,167	..	..	4 4·7-*in.*, 8 3-*pr.*, 2 M., 1 l.	3 (1 sub.)	16·7	450	147
" "	Scylla	3400	300	43	16½	9280	Poplar	Penn	1892	1893	181,010	2–1	2	2 6-*in.*, 6 4·7-*in.*, 8 6-*pr.*, 1 3-*pr.*, 4 M., 1 l.	4	20·62	400	273
T. G. B.	Seagull	735	230	27	8¼	3500 Nic.	Chatham.	Maudslay	1889	1890	60,332	..	2	2 4·7-*in.*, 4 3-*pr.*	3	20·0	100	91
" "	Sharpshooter	735	230	27	8¼	3500 B.	Devonp'rt	Bellis	1888	1889	56,955	..						
Scout	Sentinel	2900	360	40	14½	17,000 E.	Barrow	Vickers	Bldg.	..	Details not complete.	1½–⅝	..	10 12-*pr.*	2	25	165 / 380	268
3rd cl. Cr.	Severn	4050	300	46	19	6000	Chatham.	Humphrys.	1885	1888	264,924	3–2	4	2 8-*in.*, 10 6-*in.*, 3 6-*pr.*, 2 3-*pr.*, 10 M., 2 l.	..	17·3	900	327
Sloop	Shearwater shd.	980	180	33	11½	1400 B.	Sheerness	Thames Co.	1901	1901	69,120	..	..	6 4-*in.*, 4 3-*pr.*	..	13·25	130	130
T. G. B.	Sheldrake	735	230	27	8¼	3500 B. & W.	Chatham.	Maudslay	1889	1890	59,555	..	2	2 4·7-*in.*, 4 3-*pr.*	3	20·5	100	91
" "	Skipjack	735	230	27	8¼	6000 R.	Chatham.	Laird	1889 1899	1890	61,225	..						
" "	Spanker	735	230	27	8¼	3920 Du T.	Devonp'rt	Bellis	1889	1890	57,031	..	2	2 4·7-*in.*, 4 3-*pr.*	3	20·5	100	91
" "	Speedwell*	735	230	27	8½	6000 R.	Devonp'rt	Laird	1889 1899	1890	..	..						
1st cl. Cr.	Spartiate. shd.	11,000	435	69	26	18,658	Pembroke	Maudslay	1898	1902	680,188	4–2½	4½–2	16 6-*in.*, 12 12-*pr.*, 3 3-*pr.*, 8 M., 2 l.	3 (2 sub.)	21·0 t	1000	600

GREAT BRITAIN.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
3rd cl. Cr.	**Sirius** . shd.	3600	300	43¾	17½	9000	Elswick	Maudslay	1890	1892	195,934	2–1	2	2 6-*in.*, 6 4·7-*in.*, 8 6-*pr.*, 1 3-*pr.*, 4 M., 1 l.	4	19·75	400	273
" "	**Spartan** . shd.	3600	300	43¾	17½	9000	Elswick	Maudslay	1891	1893	195,302							
1st cl. G. B.	**Sparrow**	805	165	31	11¼	1200	Greenock	Greenock	1889	1890	43,642	..	..	6 4-*in.*, 2 3-*pr.*, 2 M.	..	13·0	105	76
T. G. B.	**Speedy**	810	230	27	8¾	4703 T.	Chiswick	Thornycrft	1893	1894	61,114	..	2	2 4·7-*in.*, 4 3-*pr.*	3	20·21	100	91
" "	**Spider**	525	200	23	8¾	2700	Devonp'rt	Maudslay	1887	1888	48,189	..	0·22	1 4-*in.*, 6 3-*pr.*	4	19·0	80	67
2nd cl. G.B.	**Starling**	465	125	23½	10	360	Poplar	Rennie	1882	1883	..	..	..	2 64-*pr.* M.L.B., 2 20-*pr.*, 2 M.	..	9·5	40	61
" "	**Stork**	465	125	23½	10	360	Poplar	Rennie	1882	1883	..	..	..	1 M., 2 l.	..	9·5	40	61
D. V.	**Surprise**	1650	250	32½	14	3000	Jarrow	Palmer	1885	1887	85,457	..	..	4 5-*in.*, 4 6-*pr.*, 2 M.	..	17·0	400	114
Sloop	**Swallow**	1130	195	28	11½	1500	Sheerness	Rennie	1885	1887	..	..	..	8 5-*in.*, 8 M.	..	13·5	280	135
2nd cl. G.V.	**Swift**	756	165	29	11	870	Blackwall	Rennie	1879	1881	..	..	..	2 90-*cwt.* M.L.B., 4 6-*pr.*, 2 M.	..	11·81	180	92
2nd cl. Cr.	**Talbot** . shd.	5600	350	53½	21	9600	Devonp'rt	Devonport	1895	1897	280,119	1½–3	3	11 6-*in.*, 9 12-*pr.*, 1 3-*pr.*, 4 M., 1 l.	3 (2 sub.)	20·0	550	433
3rd cl. Cr.	**Tartar**	1770	225	36	14¼	3500	Glasgow	Thomson	1886	1888	100,592	..	..	6 6-*in.* Q.F.C., 8 3-*pr.*, 2 M., 1 l.	3	16·5	325	177
" "	**Tauranga** (Australia)	2575	265	41	15½	7500	Glasgow	Thomson	1889	1891	135,698	2–1	2	8 4·7-*in.*, 8 3-*pr.*, 4 M., 1 l.	4	19·0	300	212
" "	**Terpsichore**	3400	300	43	16½	9000	Glasgow	Thomson	1890	1892	182,626	2–1	2	2 6-*in.*, 6 4·7-*in.*, 8 6-*pr.*, 1 3-*pr.*, 9 M., 1 l.	4	20·0	400	275
1st cl. Cr.	**Terrible** * . shd.	14,200	500	71	27	25,000 B.	Glasgow	Thomson	1895	1898	740,584	3–6	6	2 9·2-*in.*, 16 6-*in.*, 18 12-*pr.*, 12 3-*pr.*, 9 M., 2 12-*pr.* boat.	4	22·4	1500 / 3000	840
3rd cl. Cr.	**Thames**	4050	300	46	19¼	5700	Pembroke	Penn	1885	1888	260,845	3–2	4	2 8-*in.*, 10 6-*in.*, 3 6-*pr.*, 8 3-*pr.*, 6 M., 2 l.	2	16·8	900	326
1st cl. G. B.	**Thistle**	700	180	33	8	1300 Y.	Glasgow	London and Glasgow Co.	1901	1900	54,133	..	..	2 4-*in.*, 4 12-*pr.*	..	13·5	50	85
1st cl. Cr.	**Theseus**	7350	360	60	23¾	12,000	Blackwall	Maudslay	1892	1894	377,913	5–1	6	2 9·2 *in.*, 10 6-*in.*, 12 6-*pr.*, 5 3-*pr.*, 7 M., 2 l.	4 (2 sub.)	20·0	850	544
3rd cl. Cr.	**Thetis**	3400	300	43	16½	9000	Glasgow	Thomson	1890	1892	182,431	2–1	2	2 6-*in.*, 6 4·7-*in.*, 8 3-*pr.*, 1 3-*pr.*, 4 M., 1 l.	4	20·0	400	273
" "	**Tribune**	3400	300	43	16½	9000	Glasgow	Thomson	1891	1892	182,291							
1st cl. G. B.	**Thrush**	805	165	31	11½	1200	Greenock	Greenock F'ndry Co.	1889	1890	43,642	..	..	6 4-*in.*, 2 3-*pr.*, 2 M.	..	13·0	105	76
3rd cl. Cr.	**Topaze**	3000	360	40	14½	9800 L.N.	Birkene'd	Laird	Bldg.	..	229,524	..	..	12 4-*in.*, 8 3-*pr.*	..	21·75	300	..
Sloop	**Torch** . shd.	960	180	32½	11½	1400	Sheerness	Sheerness	1894	1896	65,064	..	..	6 4-*in.*, 4 3-*pr.*, 2 M.	..	13·25	130	101
2nd cl. Cr.	**Venus** . shd.	5600	350	54	21¼	9600	Fairfield	Fairfield	1895	1898	270,390	2½	3	11 6-*in.*, 9 12-*pr.*, 7 3-*pr.*, 4 M., 1 l.	3 (2 sub.)	19·5	550	470
Sloop	**Vestal** . shd.	980	180	33	11½	1400 B.	Sheerness	Governm't	1901	1901	78,021	..	..	6 4-*in.*, 4 3-*pr.*	..	13·25	130	130
2nd cl. Cr.	**Vindictive**	5800	320	54	20¼	10,000 B.	Chatham	Chatham	1896	1899	293,434	1–2 N S.	3	10 6-*in.* Q.F., 9 12-*pr.*, 3 3-*pr.*, 5 M., 1 l.	2	19·5	500	450
T. D. S.	**Vulcan**	6620	350	58	23	12,032	Portsm'th	Humphrys	1889	1894	380,831	5–2½	2	8 4·7-*in.*, 12 3-*pr.*, 16 M., 1 l.	6 (2 sub.)	20·0	1000	433
3rd cl. Cr.	**Wallaroo** (Australia)	2575	265	41	15½	7500	Elswick	Hawthorn	1889	1891	123,592	2–1	2	8 4·7-*in.*, 8 3-*pr.*, 4 M., 1 l.	4	19·0	300	218
1st cl. G. B.	**Widgeon**	805	165	30	11½	1200	Pembroke	Rennie	1889	1891	45,961	..	..	6 4-*in.*, 2 3-*pr.*, 2 M.	..	13·0	105	76

3 third-class cruisers. Programme 1903-4. No details known.
4 new scouts. " " " "
2 Coast Guard cruisers. " " " "
1 river gunboat. " " " "

* Under repair by Palmer, of Jarrow.

River Gunboats.—Herald, Mosquito (1890), 82 tons; Jackdaw, Heron, Robin, Nightingale, Snipe (1897), 85 tons; Woodcock, Woodlark (1897), 122 tons, 2 6-prs., 4 Maxims; Teal, Moorhen (1901), 180 tons, 2 6-prs., 13 knots; 4 recent boats in the Niger Protectorate. Recent Egyptian boats: Melik, Sultan, Sheik, 140 tons, 4 12-prs., 4 Maxims.

Royal Naval Reserved Merchant Cruisers.

—	Name.		Owners.	Length.	Breadth.	Draught of Water for the Admiralty List.	Gross Tonnage.	Indicated Horse-Power.	Ocean Speed.
				Feet.	Feet.	Feet.	Tons.		Knots.
	Two new ships		Cunard Company	760	80	..	..	60,000	25
	Campania		" "	610	65	26	12,950	30,000	21
	Lucania		" "	610	65	26	12,950	30,000	21
	Himalaya		Peninsular and Oriental Co.	465½	52	22½	6,898	10,000	17
	Australia		" " "	465½	52	22½	6,901	10,000	17
	Victoria		" " "	466	52	22½	6,091	7,000	16
	Arcadia		" " "	466	52	22½	6,188	7,000	16
	Majestic	2 s.	White Star Company	565	58	21½	9,965	16,000	20
	Teutonic	2 s.	" "	565	58	21½	9,984	16,000	20
Ships in receipt of an annual subvention and permitted to fly the blue ensign.	Empress of India	2 s.	Canadian Pacific Railway Co.	440	51	21½	5,905	10,000	16
	Empress of China	2 s.	" "	440	51	21½	5,905	10,000	16
	Empress of Japan	2 s.	" "	440	51	21½	5,905	10,000	16
	Oceanic		White Star Line	685¼	68¼	..	17,274	28,000	21
	Caledonia		Peninsular & Oriental Co.	486	54¼	..	7,558	10,000	18½
	India		" " "	500	54¼	..	7,911	9,400	18
	Persia		" " "	500	54¼	..	7,951	9,400	18
	Arabia		" " "	500	54¼	..	7,930	9,400	18
	Omrah		Orient Co.	490¾	56¾	..	8,291	10,000	18
	Ophir		"	465	53½	..	6,910	10,000	18
	Danube		Royal Mail Steam	420	52	..	5,946	6,650	17
	Nile		" " "	420	52	..	5,946	6,650	17
	Ortona		Pacific	500	55¼	..	7,945	10,000	18

There are also numerous ships on the Admiralty List complying with Admiralty conditions as to subdivision which have no national tie. They are suitable for receiving an armament, but there is no arrangement with owners, except the promise of preference for occasional State employment.

—	Name.	Owners.	Length.	Breadth.	Draught of Water for the Admiralty List.	Gross Tonnage.	Indicated Horse-Power.	Ocean Speed.
			Feet.	Feet.	Feet.	Tons.		Knots.
Ships held at the disposition of the Admiralty without subsidy.	**Etruria**	Cunard Company	501½	57	26	8,120	14,500	19½
	Umbria	,, ,,	501½	57	26	8,128	14,500	19½
	Aurania	,, ,,	470	57	27	7,269	9,500	17
	Britannic	White Star Company	455	45	25	5,004	5,200	16
	Germanic	,, ,,	455	45	25	5,008	5,200	16
	Cymric	,, ,,	..	..	..	12,551	6,700	16
	Britannia	Peninsular and Oriental Co.	466	52	22½	6,525	7,000	16
	Oceana	,, ,, ,,	466	52	22½	6,188	6,000	16
	Peninsular	,, ,, ,,	410½	48	..	5,287	4,972	15
	Oriental	,, ,, ,,	410½	48	..	5,284	4,972	15
	Valetta	,, ,, ,,	420½	45	22½	4,904	5,000	15
	Massilia	,, ,, ,,	420½	45	22½	4,902	5,000	15
	Rome	,, ,, ,,	430	44½	22½	5,545	5,500	15
	Carthage	,, ,, ,,	430	44½	22½	4,879	5,000	15
	Ballarat	,, ,, ,,	420	43	22½	4,778	4,500	14
	Parramatta	,, ,, ,,	420	43	22½	4,756	4,500	14
	Gothic	White Star Line	490	53¼	..	7,755	..	15
	Medic	,, ,,	550	63¼	..	11,985	..	13
	Cedric	,, ,,	700	75	..	20,000	..	..
	Ivernia	Cunard Co.	582	65	..	13,800	10,000	16
	Saxonia	,,	580	64¼	..	13,800	10,000	16
	China	Peninsular & Oriental Co.	500½	54¼	..	7,912	9,400	18
	Egypt	,, ,, ,,	500	54¼	..	7,912	9,400	18
	Ormuz	Orient Co.	465½	52	..	6,387	9,000	18
	Austral	,,	456	48¼	..	5,524	7,000	17
	Orient	,,	445½	46¼	..	5,631	8,000	16
	Thames	Royal Mail Steam	436	50¼	..	5,645	5,740	17
	Clyde	,, ,, ,,	436	50¼	..	5,645	5,740	17
	Tagus	,, ,, ,,	410	50	..	5,545	5,740	17
	Trent	,, ,, ,,	410	50	..	5,573	5,740	17
	Magdalena	,, ,, ,,	421	50	..	5,362	5,600	17
	Atrato	,, ,, ,,	421	50	..	5,366	5,600	17

GREAT BRITAIN, COLONIES, &c.—Cruising Ships, Gunboats, &c.

To what Government belonging.	Class of Ship.	Name.	Material of Construction.	Propellers.	Where Built.	When Launched.	Length.	Breadth.	Draught of Water.	Displacement.	Indicated Horse-Power.	Speed.	Coal Stowage.	Armament.
							ft. in.	ft. in.	ft. in.				tons.	
INDIA	C. D. S. .	Abyssinia .	..	..	Poplar	1870	225 0	42 0	14 6	2,900	900	9·0	92	4 *8-in. 14-ton*, 7 M., 2 l.
INDIA	D. V. . .	Lawrence .	Steel	Pad.	B'kenh'd	1886	212 2	32 2	18 3	1,154	1,277	13·5	270	4 *4-in.* B.L.R., 4 *6-pr.* Q.F., 4 M.
INDIA	C. D. S .	Magdala .	..	..	Blackwll	1870	225 0	45 0	15 3	3,340	1,400	10·0	120	4 *8-in. 14 ton*, 7 M., 2 l.
QUE'NS-LAND.	Gun-vessel	Gayundah	Steel	2	Glasgow	1884	115 0	25 0	10 0	450	400	10·0	..	1 *8-in. 11½-ton*; 1 *6-in. 4-ton*; 1 *3-pr.* Q.F.; 2 M.
QUE'NS-LAND.	Gun-vessel	Paluma .	Steel	2	Glasgow	1884	115 0	25 0	10 0	450	340	10·0	..	1 *8-in. 11½-ton*; 1 *6-in. 4-ton*; 1 *3-pr.* Q.F.; 2 M.
SOUTH AUS-TRALIA	Cruiser .	Protector .	Steel	2	..	1884	188 0	3 0	12 6	920	1,640	14·0	..	1 *8-in. 11½-ton*; 5 *6-in. 4-ton*; 5 Gatlings.
VIC-TORIA	C. D. S. .	Cerebus .	..	..	Jarrow	1868	225 0	45 0	15 3	3,480	1,660	9·75	120	4 *10-in. 18-ton* M.L.R., 4 M.

The five second-class Cruisers, and the two Torpedo-Gunboats of the Australian Auxiliary Squadron are included in the list of ships of the Royal Navy.

ARGENTINE REPUBLIC.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Second-ary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
c.b.	Almirante Brown	4267	240	50	20½	4500	Poplar	1880	1882	190,000	9 comp	1½	8 comp.	7 comp.	8 comp.	..	10 5·9-in. (Canet), 4 4·7-in., 8 2·4-in., 2 M.	2	13·75 t	650	350
c.d.s.t.	Andes	1558	186	44	9½	750	Birkenhead	1875	1877	85,600	6	1	..	..	9	..	2 11-in., 2 4·7-in., 4 M.	..	9·5	120	120
a.c.	Garibaldi	6840	328	59¾	24	13,384	Sestri Ponente	1895	1896	681,240	6–3 H.S.	1½	6 H.S.	6 H.S.	6 H.S.	6 H.S.	2 10-in., 10 6-in., 6 4·7-in., 10 2·2-in., 10 1·4-in., 2 M.*	..	19·9 t	1000	500
a.c	General Belgrano	7182	328	59¾	24	13,000	Leghorn	1897	1899	..	6–3 H.S.	1½	6 H.S.	6 H.S.	6 H.S.	6 H.S.	2 10-in., 14 6-in., 2 3-in., 10 2·2-in., 8 1·4-in., 2 L., 2 M.	4 sub.	20·1 t	4000	500
c.d.s.b.	Independencia	2336	230	44¼	13	3000	Birkenhead	1891	1893	176,600											
c.d.s.b.	Libertad	2336	230	44¼	13	3000	Birkenhead	1890	1892	176,600	8 comp.	2	..	8 comp.	8 comp.	..	2 9·4-in., 4 4·7 in. (A). 4 3-pr. (A), 4 M.	2	14·4 t	340	225
a.c.	Moreno ‡	7700	344	59¾	24¼	13,500	Sestri Ponente	1903	..	..	6 H.N.S.	1½	6 H.N.S.	6 H.N.S.	6 H.N.S.	6 H.N.S.	4 8-in., 14 6-in., 10 3-in., 6 1·8-in., 2 M.	4	20·0	600 / 1150	500
c.d.s.t.	Plata	1558	186	44	9½	750	Birkenhead	1874	1877	85,600	6	1	..	..	9	..	2 11-in., 2 4·7-in., 4 M.	..	9·5	120	120
a.c.	Pueyrredon	6882	328	59¾	24	13,000 B.	Sestri Ponente	1898	1901	..	6–3 H.S.	1½	6 H.S.	5 H.S.	6 H.S.	6 H.S.	2 10-in., 10 6-in., 6 4·7-in., 10 2·2-in., 10 1·4-in., 2 M.	4 sub.	20·1 t	1000	500
a.c.	Rivadavia‡	7700	344	59¾	24¼	13,500	Sestri Ponente	1902	..	..	6 H.N.S.	1½	6 H.N.S.	6 H.N.S.	6 H.N.S.	6 H.N.S.	1 10-in., 2 8-in., 14 6-in., 10 3-in., 6 1·8 in., 2 M.	4	20·0	600 / 1150	500
a.c.	San Martin	6882	328	59¾	24	13,000	Leghorn	1896	1898	664,600	6–3 H.S.	1½	6 H.S.	6 H.S.	6 H.S.	6 H.S.	4 8-in., 10 6-in., 6 4·7-in., 12 2·2-in., 10 1·4-in., 2 L., 2 M.*	4 sub.	19·0	1100	500

* Garibaldi, San Martin, General Belgrano and Pueyrredon have Armstrong guns.
‡ Under the terms of the convention with Chili these vessels will probably be sold to another Power.

ARGENTINE REPUBLIC.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
g.v.	Argentina	820	192	27	13	850	Trieste	1883	1884	25,500	..	..	1 *6-in.*, 6 *2·7-in.* (K.), 4 M.	..	12·0	220	120
cr.	Buenos Aires shd.	4780	396	47¼	19	17,000	Elswick	1895	1895	383,000	5	4½	2 *8-in.* (A.), 4 *6-in.*, 6 *4·7-in.*, 16 *3-pr.*, 6 *1-pr.*	5	23·2* *t*	1000†	429
to.g.b.	Espora	520	210	25	8	3500	Birkenhead	1890	1891	..	..	..	3 *3-in.*, 4 *3-pr.*, 2 M.	5	20·0	100	121
cr.	Nueve de Julio	3570	354	44	19½	14,350	Elswick	1892	1892	293,000	4½	4½	4 *6-in.* (A.), 8 *4·7-in.*, 12 *3-pr.*, 12 *1-pr.*	5	22·74 *t*	770†	300
cr.	Patagonia	1442	220	32¾	12¾	2400	Trieste	1885	1887	100,000	1½	4	1 *10-in.*, 3 *6-in.*, 6 l., 10 M.	..	13·0	350	210
to.g.b.	Patria	1070	250	31	10	4500	Birkenhead	1893	1894	87,000	..	..	2 *4·7-in.*, 4 *8-pr.*, 2 *3-pr.*, 2 M.	5	20·75 *t*	288	150
g.i.	Paraná	550	142¾	25	11¾	475	Birkenhead	1874	1876	..	..	..	2 *6-in.*, 2 *4·7-in.*	..	11·0	..	..
g.i.	Uruguay	550	142¾	25	11¾	475	Birkenhead	1874	1876	..	..	..	2 *6-in.*, 2 *4·7-in.*	..	11·0	..	..
cr.	25 de Mayo	3200	325	43	16	13,800	Elswick	1890	1892	260,000	4½	4½	2 *8·2-in.* (A.), 8 *4·7-in.*, 12 *3-pr.*, 12 *1-pr.*	6	22·43 *t*	600†	185

* Natural draught. † Bunker capacity.

The training-ship (cruiser), Presidente Sarmiento, 2750 tons, 2000 I.H.P. (Niclausse boilers), and 13 knots speed, with 19 guns and three torpedo tubes; launched by Messrs. Laird, 1897. There are several other small gunboats; also the torpedo-ram Maipù (1063 tons, 1750 I.H.P.), built in England in 1880. The Florio Company sold to the Argentine Government the steamships Arno, Regina Margherita, and Sempione to be converted into cruisers; and the Spanish firm of Pinillos, Salny & Co., the Barcelona (4020 tons register), and Cadiz (4218 tons), which have been re-named Pampa and Gaucho.

AUSTRIA-HUNGARY.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Second-ary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	"A." (Ersatz Laudon) / "B." (Ersatz Drache)	10600	390½	72¼	24½	14,000 Y	Trieste	Bldg.	..	912,500	8¼ K.S.	2	5 K.S.	8 K.S.	9 K.S.	8 K.S.	4 9·4-in., 8 7·5-in., 6 6-in.. 28 smaller.	..	19·0	..	..
c.d.s.b.	Arpad / Babenberg	8340	354¼	65¾	23¼	11,000 B.	Trieste	1901 / 1902	.. / ..	650,900 / 667,000	8½ K.S.	2½	4 K.S.	8 K.S.	8¼ K.S.	5 K.S.	3 9·4-in., 12 5·9 in., 24 smaller.	..	18·0	500 / 810	..
c.d.s.	Budapest .	5550	305	55¾	21	9185 B	Trieste	1896	1897	400,600	10½ H.S.	2½	3¼ H.S.	8 H.S.	10½ H.S.	3¼ H.S.	4 9·4-in., 6 5·9-in., 14 1·8-in.	4	17·8 t	500	450
c.b.	Custoza .	7060	302¼	58	24½	4440	Trieste	1872	1875	414,400	9-5	1½	7	6	7	..	8 10·2-in. (K.), 11 Q.F., 8 l.	2	14·0	584	567
c.b.	Don Juan de Austria	3550	240¼	50	20	2700	Trieste	1875	1877	..	8-4	1	6	4¾	6	..	8 8·2-in. (K.), 11 Q.F. & M., 6 l.	4	13·0	380	440
a.c.	"E." (Ersatz Radetzky)	7100	383¾	61¾	21¼	12,300 Y	Pola	Bldg.	..	581,583	8¼-6½ K.S.	1½	5 K.S.	7 K.S.	8¼-5¼ K.S.	6 K.S.	2 9·4-in., 5 7·5-in., 4 5·9-in., 25 smaller.	..	21·0	..	..
c.d.s.	Erzherzog Albrecht	5940	285¼	56¼	22	3600	Trieste.	1872	1875	357,600	9-5	1½	..	..	7	..	8 9·4-in. (K.), 11 Q.F., 8 l.	2	13·0	453	535
h.	Habsburg .	8340	354¼	65¾	23¼	15,000 B	Trieste	1900	1902	626,000	8½ H.S.	2½	4 H.S.	8 H.S.	8¼ H.S.	5 H.S.	3 9·4-in., 12 5·9-in., 24 smaller.	..	19·6 t	500 / 840	..
a.c.	Kaiserin Maria Theresia	5270	351	52½	21¼	9755	Trieste	1893	1895	304,187	4	2	..	4	4	4	2 9·4-in., 8 5·9-in., 18 1·8-in., 2 2·7-in., 2 M.	4	19·0	740	450
a.c.	Kaiser Karl VI.	6250	367½	56	20¼	12,800 B	Trieste	1898	1900	429,000	10 H.S.	1½	6 H.S.	8 H.S.	8¾ H.S.	6 H.S.	2 9·4-in., 8 5·9-in., 18 1·8-in., 2 M.	4	20·7 t	800	450

AUSTRIA-HUNGARY.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	t ns.	
c.b.	**Kaiser Max** .	3566	240¼	50	20	2700	Trieste .	1875	1878	211,600	8–4	1	6	4¾	6	..	8 *8·2-in.* (K.), 11 Q.F. & M., 6 l.	4	13·0	380	410
Riv. Mon.	**Körös** . .	448	177	29½	4	1250	Buda Pesth	1892	1893	..	2	¾	..	..	3	..	2 *4·7-in.*, 2 l., 1 M. . .	..	10·0	..	..
b.	**Kronprinz Rudolph**	6940	295	62¼	25¼	7500	Pola . .	1887	1890	330,000	12–10	2½	..	10	10	..	3 *12-in.* (K.), 6 *4·7-in.*, 11 smaller & M., 2 l.	4	16·0	600	492
b.	**Kronprinzessin Stephanie**	5150	278¾	55¾	21½	8300	Trieste .	1887	1890	300,000	9 *comp.*	1	..	..	8 *comp.*	..	2 *12-in.* (K.), 6 *5·9-in.*, 11 Q.F. & M., 2 l.	4	17·0	400	510
Riv. Mon. ,,	**Leitha** . **Maros** .	310	166	27½	3½	320	Buda Pesth	1871	1872	20,000	1½	1	..	..	2	..	1 *4·7-in.*, 2 M. . . .	..	8·0	20	54
c.d.s.	**Monarch** . .	5550	305	55¾	21	8900	Pola . .	1895	1898	399,062	10½ H.S.	2½	3¼ H.S.	8 H.S.	10½ H.S.	3¼ H.S.	4 *9·4-in.*, 6 *5·9-in.*, 14 *1·8-in.*, 2 M.	4	17·4 *t*	500	450
c.b.	**Prinz Eugen** .	3566	240¼	50	20	2700	Pola . .	1877	1880	..	8–4	1	6	4¾	6	..	8 *8·2-in.* (K.), 11 Q.F. & M., 6 l.	4	13·0	380	410
Riv. Mon.	**Szamos** . .	448	177	29½	4	1250	Buda Pesth	1892	1893	..	2	¾	..	..	3	..	2 *4·7-in.*, 2 Q.F., 1 M. . .	..	10·0	..	..
,, ,,	**Save** . . **Theiss** .	440	184	30¾	4	1400	Neupesth .	Bldg	..	..	..	..	..	..	..	..	2 *4·7-in.*, 1 *4·7-in.* howitzer, 4 M.	..	11·0	..	..
c.b.	**Tegetthoff** .	7390	287	71	24¾	8800	Trieste .	1878 1893	1881	..	14–9	3	14	12	14	..	6 *9·4-in.* (K.), 5 *5·9 in.*, 15 smaller do., 2 M.	4	16·3 *t*	670	578
c.d.s.	**Wien** . .	5550	305	55¾	21	8480	Trieste .	1895	1897	397,850	10½ H.S.	2½ H.S.	3¼ H.S.	8 H.S.	10½ H.S.	3¼ H.S.	4 *9·4-in.*, 6 *5·9-in.*, 14 *1·8-in.*, 2 M.	4	17·6 *t*	500	450

For the Danube five patrol boats (30 tons, 2000 H.P.) are in hand, two of them fitted with Parsons' turbines.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		met. tns.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
to. cr.	**Aspern**	2400	301¾	39½	14¼	7300 Y	Pola	1899	1901	155,000	2	..	8 *4·7-in.*, 8 *1·8-in.*	1	20·0	470/500	242
to. g. b.	**Blitz**	360	193½	22¼	8	3500	Elbing	1888	1899	..	..	..	9 Q.F.	..	21·0	250	61
cr. 3rd cl.	**Donau**	2344	230	42¾	19¾	1800	Pola	1893	1895	..	..	..	10 *4 7-in.* (Uchatius), 4 M., 1 l.	..	12·0	320	311
cr. 2nd cl.	**Kaiserin Elizabeth**	4064	321½	47½	18½	9000	Pola	1890	1892	..	2¼	3½	2 *9·4-in.* (K.), 6 *5·9-in.* do., 11 Q.F., 2 l.	5	19·0	660	450
cr. 2nd cl.	**Kaiser Franz Josef I.**	4030	321½	47½	18½	9000	Trieste	1889	1891	..	2¼	3½	2 *9·4-in.* (K.), 6 *5·9-in.* do., 11 Q.F., 2 l.	5	19·0	660	450
to. g. b.	**Komet**	360	193½	22¼	8	3500	Elbing	1888	1889	..	..	..	9 Q.F.	..	21·0	50	61
cr. 3rd cl.	**Leopard.**	1530	224	34	14	6000	Elswick	1886	1888	200,000	..	..	2 *4·7-in.*, 10 smaller & M.	4	18·3	250	148
to. g. b.	**Lussin**	1011	200¼	26¼	12¼	1830 Dürr.	Trieste	1883	1885	..	1½	..	2 *5·9-in.* (K.), 7 M., 1 l.	..	14·0	200	142
to. g. b.	**Magnet**	510	219¾	26¾	8	5000 T	Elbing	1896	1899	51,052	..	..	6 *1·8-in.*	3	26·0 t	105	76
to. g. b.	**Meteor**	350	187	22¼	8	3500	Elbing	1887	1889	..	..	..	9 Q.F.	1	23.1	120	61
cr. 3rd cl.	**Panther**	1530	224	34	14	6000	Elswick	1885	1887	..	..	..	2 *4·7-in.*, 10 smaller & M.	4	18·5	250	148
to. deps.	**Pelican**	2470	279	39¼	15½	4600	Elbing	1891	1893	..	..	..	2 *5·9-in.* (K.), 8 smaller	4	18·0	..	..
to. g. b.	**Planet**	500	210	23	8¼	3500	Jarrow	1889	1890	..	..	..	10 Q.F.	1	19·6	78	78
to. g. b.	**Satellit**	540	220½	26¾	9¼	4000	Elbing	1893	1893	..	1½	..	9 Q.F.	..	21·87	76	61
to. g. b.	**Sebenico**	900	187	26¼	12¼	1380	Pola	1882	1884	..	..	..	7 Q.F., 5 l.	..	14·0	200	142
cr. 3rd cl.	**Spalato**	850	179½	26¼	12¼	1200	Trieste	1879	1881	..	..	..	7 Q.F., 5 l.	..	14·0	150	142
to. cr.	**Szigètvár**	2350	301¾	39½	14¼	7300 Y.	Pola	1899	1901	155,000	2	..	8 *4·7-in.*, 12 *1·8-in.*	1	20·0	470/500	242
to. cr.	**Tiger**	1675	233	32¾	15½	5260	Trieste	1887	1889	..	..	..	4 *4 7-in.*, 10 smaller	..	18·0	300	190
to. g. b.	**Trabant**	530	210	23	8¼	3500	Trieste	1890	1891	..	..	..	10 Q.F.	1	20·0	..	61
to. v.	**Zara**	850	179½	26¼	12¼	1200	Pola	1879	1880	..	..	..	7 Q.F., 5 l.	..	14·0	150	142
to. cr.	**Zenta**	2300	301¾	39½	12¼	7300 Y.	Trieste	1897	1899	143,780	2	..	8 *4 7-in.*, 12 *1 8-in.*, 2 M.	1	20·9 t	470/500	242

Four screw gunboats, between 540 and 870 tons displacement and 250 and 950 indicated horse-power.

BRAZIL.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkheads.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons	
t. River	Alagoãs . .	340	120	28	4¾	180	Brazil . .	1886	1888	..	4½	4½	..	..	4½	..	1 *7-in.* M.L.R. (Whitworth), 2 M.	..	7·0	..	43
t.	Aquidaban shd.	4950	280	52	18	6200	Poplar .	1885 1897	1887	315,000*	11 *comp.*	2	..	10 *comp.*	10 *comp.*	..	4 *9·4-in.* (Canet), 4 *5·5-in.*, 2 smaller, 13 M.	5	15·0	600	350
t. River	Maranhao .	470	137	31½	6½	700	Rio de Janeiro	1890	1892	..	5 H.S.	..	..	..	..	..	2 *4·7-in.*, 1 *2·5-in.*, 5 M. . .	..	12·0	..	..
c.d s., t.	Marshal Deodoro	3162	267½	48	13¼	3400	La Seyne D'A.	1898	1900	..	13¾–4 H.S.	1½	..	..	8 H.S.	3 H.S.	2 *9·4-in.*, 2 *5·9-in.* howitzers, 4 *4·7-in.*, 2 M., 4 *6-pr.*, 2 *1-pr.*	2 (sub.)	15·0	236	200
c.d.s., t.	Marshal Floriano							1899	1901												
t. River	Pará . . .	470	137	31½	6½	700	Rio de Janeiro	1890	1892	..	5 H.S.	..	..	..	..	..	2 *4·7-in.*, 1 *2·5-in.*, 5 M. . .	..	12·0	..	..
t. River	Piauhy . .	340	120	28	4¾	180	Brazil .	1887	1889	..	4½	4½	..	..	4½	..	1 *7-in.* M.L.R. (Whitworth) .	..	7·0	..	43
t.	Riachuelo shd.	5700	305	52	19½	7300	Poplar .	1883 1895	1888	365,000*	11 *comp.*	2	..	10 *comp.*	10 *comp.*	..	4 *9·2-in.* (Whitworth, altered by Armstrong), 6 *4·7-in.*, 2 *3-pr.*, 15 M.	5	16·71	800	450
t. River	Rio Grande .	340	120	28	4¾	180	Brazil .	1888	1890	..	4½	4½	..	..	4½	..	1 *7-in.* M.L.R. (Whitworth) .	..	7·0	..	43

* Exclusive of guns and ammunition.

Floating batteries, Brazil (1518 tons) and Lima-Barros (1444 tons). Foreign-built ships in metric tons.

BRAZIL.—Cruising Ships, &c.

Class.	NAME.		Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal	Complement.
												Deck.	Gun Position.	Guns.	Torpedo Tubes.			
			tons.	ft.	ft.	ft.						in.	in.			knots.	tons.	
cr.	Almirante Tamandare	shd.	4735	294	46	18¼	7500	Brazil	1890	1893	..	1½	3	10 6-in., 2 4·7-in., 8 M.	8	17·0	750	450
,,	Andrada (ex America)	shd.	2600	252¾	34	18	3600	Bergen	1890	1892	..	..	..	2 4·7-in., 2 14-pr., 6 6-pr., 6 1-pr.	5	17·0	..	300
,,	Barroso	shd.	3600	330	43¾	16¾	7500	Elswick	1896	1897	..	3	4½ shields	6 6-in., 4 4·7-in., 10 6-pr., 4 1-pr., 4 M.	3	20·0	700	300
,,	Benjamin Constant	shd.	2750	236	46	18	2800	La Seyne	1892	1894	..	2	..	4 6-in., 8 4·7-in., 8 M., 4 l.	4	14·0	260	287
to.cr.	Caramuru		1030	249½	30¾	10¼	6000	Kiel	1896	1897	..	½	..	2 3·9-in., 6 2·2-in., 2 1·4-in	3	22·5	..	..
to.g.b.	Gustavo Sampaio		500	197	21	7¾	2500	Elswick	1893	1894	..	..	..	2 20-pr., 4 7-pr.	3	18·0	150	95
,,	Paysandu (ex Guanabára)		1900	200	41¼	16¼	3000	Brazil	1877	1879	..	..	..	9 70-pr. M.L.R. (Whitworth), 6 M., 2 l.	..	13·0	..	250
cr.	Primeiro de Março		726	167¼	26½	10½	750	Brazil	1881	1883	..	..	..	7 4·5-in. M.L.R. (Whitworth), 4 M.	..	9·0	..	..
,,	Quinze de Novembro (ex Republica)		1300	210	35	13	3300	Elswick	1892	1894	..	2–1	..	6 4·7-in., 4 6-pr., 6 M.	4	17·0	170	160
to.cr.	Tamoyo		1080	269	28¾	9¾	6500	Kiel	1898	1900	..	..	4½ shields	2 3·9-in., 6 2·2-in., 2 1·4-in., 2 M.	3	23·0	293	110
,,	Timbira		1030	219½	30¾	10¼	7000	Kiel	1896	1897	..	½	4½ shields	2 3·9-in., 6 2·2-in., 2 1·4-in., 2 M.	3	22·5	250	110
g.v.	Tiradentes	shd.	800	165	30	11	1200	Elswick	1892	1893	..	..	..	4 4·7-in., 3 6-pr., 4 M.	2	14·5	110	107
,,	Trinidade (ex Liberdade)		250	101¾	21¾	10¾	280	Brazil	1884	1886	..	..	..	2 l., 1 M.	..	10·0	..	..
to.cr.	Tupy		1030	249½	30¾	10¼	7000	Kiel	1896	1897	..	½	4½ shields	2 3·9-in., 6 2·2-in., 2 1·4-in., 2 M.	3	22·5	250	110

Ten screw gunboats, 200 tons to 400 tons, and eight paddle gunboats, 120 tons to 160 tons.

CHILI.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Second-ary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			kts.	tons.	
c.b.	Almirante Cochrane shd.	3500	210	45¾	19¾	2920	Hull	1874	1877	..	9	3	8	6	8	..	6 *8-in.* A., 4 *6-pr.*, 4 *3-pr.*, 7 M.	3	13·0	350	242
a.c.	Almirante O'Higgins shd.	8500	411¾	62½	22	16,000 B.	Elswick	1897	1898	..	7–5	2	..	..	7½–6	6	4 *8-in.*, 10 *6-in.*, 4 *4·7-in.*, 10 *12-pr.*, 10 *6-pr.*, 4 M.	3 (2 sub.)	21·5 t	1260	..
b.	Capitao Prat shd.	6900	328	60¾	21¾	12,000	La Seyne	1890	1893	391,000	12	3	4	..	10½	2	6 *9·4-in.* (Canet), 8 *4·7-in.* (Canet), 6 *2·2-in.*, 4 *1·8-in.*, 10 *1 4-in.*, 5 M.	4	18·3 t	775	485
b. b.	Constitucion* Libertad*	11,800	436	71	24¾	13,000 Y. 2	Elswick / Barrow	1903	..	..	7–3	3	7	3	10–8	7	4 *10-in.*, 14 *7·5-in.*, 14 *14-pr.*, 4 *6-pr.*, 4 M. 2 l.	(2 sub.)	19·0	2000	..
a.c.	Esmeralda	7020	436	53¼	22¼	16,000	Elswick	1896	1897	..	6 H.S.	2	..	6 H.S.	4½ Shields	..	2 *8-in.*, 16 *6-in.*, 8 *12-pr.*, 2 *3-pr.*, 4 M.	3 (2 sub)	22·8 t	1350	500

* Under the Convention with Argentina, these ships are to be sold to another Power.

The Huascar, 1800 tons, launched at Birkenhead in 1865, is now a floating battery.

Cruising Ships, &c.

Class	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						in.	in.			knots.	tons.	
to.g.b ,,	Almirante Condell, Almirante Lynch	750	240	27½	10½	4500 B.	Birkenhead	1890	1892	..	..	..	3 *14-pr.*, 4 *3-pr.*, 2 M.	5	21·0	210	..
,,	Almirante Simpson	812	210	27½	10½	4700 N.	Birkenhead	1896	1896	..	..	4½	2 *4 7-in.*, 4 *3-pr.*	3	21·0t	200	..
cr.	Blanco Encalada shd.	4400	370	46½	18½	14,500	Elswick	1893	1894	..	4-1¾	..	2 *8 in.*, 10 *6-in.*, 12 *3-pr.*, 10 *1-pr.**	5	22·78 t	†900	427
,,	Chacabuco shd	4500	360	46	18‡	15,750	Elswick	1901	1903	..	4½-1¾	..	2 *8-in.*, 10 *4·7-in.*, 16 *1·8-in.*, 2 M., 1 l.	5	23·0	1000 †	..
,,	General Baquedano (Training)	2330	240	45¾	18‡	1500 B.	Elswick	1898	1900	..	..	..	4 *4·7-in.*, 2 *12-pr.*, 2 *6-pr.*, 2 M., 1 l.	1	13·7 t.	200	302
cr.	Ministro Zenteno shd.	3600	330¼	43¾	16¾	6500	Elswick	1896	1898	..	..	..	8 *6-in.*, 10 *6-pr.*, 4 *1-pr.**	3	20·0t	300 800	..
cr. ,,	Presidente Errázuriz, Presidente Pinto shd.	2080	268	35¾	19½	5400	La Seyne	1890	1892	..	3½	..	4 *6-in.* (Canet), 2 *5-in.*, 4 *2·2-in.*, 6 M.	3	19·0	200	171

* Armstrong. † Bunker Capacity. ‡ Mean Draught.

Two Gunboats of 145 tons displacement and one of 180 tons.

CHINA.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						in.	in.			kts.	tons.	
cr.	Foo-Ching	2500	253	36¼	18	2400	..	1893	1895	..	4–2	4½	3 5-*in.* (K.), 4 M., 2 l.	..	16·0	..	..
to g.b.	Fei-Ying	850	257¼	28½	12½	4500 Y.	Stettin	1895	1895	..	..	2	2 4-*in.*, 6 3·4-*in.*, 4 smaller	3	21·8 *t*	75	90
cr.	Hai-Chi.	4300	396	46¾	18½	17,000	Elswick	1898	1899	..	5	6	2 8-*in.*, 10 4·7-*in.*, 12 3-*pr.*, 4 1·4-*in.*, 6 M.	5	24·0	300	374
"	Hai-Shen							1898	1898								
"	Hai-Shew	2950	314¾	41	16	8000	Vulcan . Stettin .	1897	1898	..	3	2	3 6-*in.* (K.), 8 4-*in.*, 6 1·4-*in.* Hotchkiss, 6 M.	3 (1 sub.)	20·7 *t*	220 / 500	244
"	Hai-Yung							1897	1898								
"	Hai-Tien	4300	396	46¾	18½	17,000	Elswick	1897	1899	..	5	6	2 8-*in.*, 10 4·7-*in.*, 12 3-*pr.*	5	24·1 *t*	300	374
"	Hi-Ying	2200	253	36¼	18	2400	..	1895	..	..	..	..	2 8-*in.* (A.), 8 4·7-*in*, 4 M.	1	21·0	..	..
"	Huang-Tái	2110	260	36	20	1600	..	1886	1888	..	..	..	3 7-*in.* (K.), 7 40-*pr.*, 6 M.	2	15·0	360	300
to cr.	Kien-Wei*	875	256	26½	10½	7000 N.S.	Foochow	1900	1902	..	..	..	1 3 9-*in.*, 3 2·5-*in.*, 6 1·4-*in.*	2	22·5	360	300
"	Kien-Gnan*						Foochow	1899	1902	..	..	..					
cr.	King-Ching	2100	250	36	20	2400	..	1886	1888	..	..	..	3 7-*in.* (K.), 7 40-*pr.*, 6 M.	2	14·5	360	300
to.g.b.	Kwang-Ting	1000	235	27½	11¼	3400	..	1890	1892	..	..	..	3 4·7-*in.*, 4 M., 2 l.	4	16·0	..	120
cr.	Nan-Schuin	2200	253	36¼	18	2400	Kiel	1884	1886	..	..	..	2 8-*in.* (A.), 8 4·7-*in.*, 9 M.	1	14·5	600	250
"	Nan-Ting	2200	253	36¼	18	2400	Kiel	1883	1885	..	..	..	2 8-*in.* (A.), 8 4·7-*in.*, 9 M.	1	15·0	600	250

The displacement of German-built ships in metric tons.

Torpedo-gunboat Pei-Ting (349 tons), four gunboats of 411 tons, two of 300 tons, four of 215 tons (defence of Canton Roads), training vessel Tung-Chi, 1700 tons—all launched 1885–88. **Kai Chih**, cruiser, 2110 tons, built at Foochow in 1882, blown up by magazine explosion at Nanking, June 22, 1902.

* It has been proposed to buy these vessels for the French Navy, but no action has yet been taken.

DENMARK.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Second-ary.	Guns.	Torpedo Tubes.			
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
c.d.s.,t.	Gorm . .	2344	231	40	14	1670	Copenhagen	1870	1873	104,000	7–4½	..	..	..	8	..	2 *10-in.* (A.) M.L.R., 3 *3·4-in.* (K.), 4 M.	..	12·25	115	158
t.	Helgoland. .	5347	257½	59¼	18¾	4000	Copenhagen	1878	1881	275,000	12–6	4	10	7	10	..	1 *12-in.* (K.), 4 *10·2-in.*, 5 *4·7-in.*, 10 M.	4	12·0	230	350
c.d.s.,t.	Herluf Trolle .	3470	271	50	16¼	4200 T.	Copenhagen	1899	1901	..	8–4 H.S	2	7 H.S.	..	6 H.S.	6 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 10 *2·2-in.*, 8 smaller.	3 (sub.)	16·0	..	..
b.	Iver Hvitfeldt .	3260	242	49½	18	5100	Copenhagen	1886 1900	1889	200,000	12	2	..	9½	8	..	2 *10·2-in.* (K.), 4 *4·7-in.*, 12 M.	4	15·6	250	298
c.d.s.,t.	Lindormen .	2076	216	39½	13¾	1560	Copenhagen	1868	1870	93,000	5–3	..	..	..	6	..	2 *9-in.* (A.) M.L.R., 3 *3·4-in.* (K.), 4 M.	..	12·0	120	140
c.b.	Odin . . .	3083	237	50	15½	2260	Copenhagen	1872 1902	1875	147,000	8–4	1½	..	7	8 *comp.*	..	4 *10-in.* (A.) M.L.R., 4 *3·4-in.* (K.), 7 M.	..	12·4	180	236
c.d.s.,t.	Olfert Fischer .	5470	271	59	18¾	4200	Copenhagen	Bldg.	..	..	8–4 K.S.	..	7 K.S.	..	6 K.S.	..	2 *9·4-in.*, 4 *5·9-in.*, 10 *2·2-in.*, 8 smaller.	3 (sub.)	16·0	..	..
.	Skjold . .	2150	226½	38	13½	2200 T.	Copenhagen	1896	1899	..	9	2	..	7	8	4½	1 *9·4-in.*, 3 *4·7-in.* (T.), 4 *1·8-in.*, 1 M.	4	13·0	280	210
T. S.	Tordenskjold .	2400	221½	43½	15½	2600	Copenhagen	1880	1883	138,900	..	4–2	..	..	8 *comp.*	..	1 *14-in.* (K.), 4 *4·7-in.*, 8 M.	4	14·0	170	220

Esbern Snare (torpedo school-ship), 530 tons, 2-in. belt.

DENMARK.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
cr.	Fyen . . shd.	2596	226½	45½	18	2700	Copenhagen .	1882	1884	170,000	1½	..	18 5·9-*in.* (K.), 8 M. .	2	13·0	290	407
3rd cl. cr.	Geiser . . .	1280	257½	27½	11¼	3000 T.	Copenhagen .	1892	1893	..	1½	..	2 4·7-*in.*, 4 3·4-*in.*, 6 M. .	4	17·1 *t*	125	155
”	Heimdal . .	1280	257½	27½	11¼	3000	Copenhagen .	1894	1896	..	1½	..	2 4·7-*in.*, 4 3-*pr.*, 6 M. .	4	17·5	125	155
”	Hekla . . .	1280	233	32¾	11¼	3000	Copenhagen .	1890	1893	..	1½	..	2 6-*in.*, 4 2·2-*in*, 6 M. .	4	17·0	125	155
cr.	Valkyrien . .	2900	268	43½	18	5300	Copenhagen .	1887 1896	1890	..	2⅜	..	2 8·2-*in.* (K.), 6 5·9-*in.*, 4 Q.F., 10 M.	5	17·0	450	300

Gunboats.—Five in number (*Lille Belt*, *Öresund*, *Store Belt*, *Grönsund*, *Guldborgsund*), of 150 to 240 tons, 200 to 400 I.H.P. The *Guldborgsund* is receiving new boilers; boilers of the *Grönsund* and the cruiser *Heimdal* being improved, 1903.

Dagmar (training-ship), corvette, 1200 tons; *Hjaelperen* (mining), 280 tons; *Sleipnir* (ice-breaker), 1260 tons, 3000 I.H.P. Training-brig *Örnen* in hand.

The *Beskytteren*, torpedo transport, 389 tons, 600 I.H.P., B. & W. boilers, 3 1·8-in. Q.F., launched 1900.

FRANCE.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour: Belt.	Armour: Deck.	Armour: Side above Belt.	Armour: Bulkhead.	Armour: Gun Position: Heavy Guns.	Armour: Gun Position: Secondary.	Armament: Guns.	Armament: Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
a.g.b.	Achéron . .	1721	181	40½	11¾	1700	Cherbourg.	1885 1900	1887	100,000	9½–6 comp.	2½	..	..	8 comp.	..	1 10·8-in., 3 3·9-in., 2 1·8-in., 4 M.	..	13·0	100	101
a.c.	Aube . .	10,014	453	66¼	24½	20,500 B.	St. Nazaire	1902	..	973,440	6–4 H.S.	2	5–2 H.S.	..	7½ H.S.	6½–5 H.S.	2 7·6-in., 8 6·4-in., 4 3·9-in., 26 small Q.F. and M.	4 (2 sub.)	21·0	970 / 1590	615
b.	Baudin . .	11,911	321½	69¾	26¼	8320	Brest .	1883 1899	1885	600,000	14–10	4	..	..	16½	4½	2 16·8-in., 4 6·4-in., 8 5·5-in., 36 small Q.F. and M.	4	15·0	800	630
t.	Bouvet . .	12,200	401¼	70¼	27½	14,000 B.	Lorient .	1896	1898	1,100,770	15¾–8 H.S.	3½	4 H.S.	..	14½ H.S.	4 H.S.	2 12-in., 2 10·8-in., 8 5·5-in., 8 3·9-in., 19 small Q.F. and M.	4 (2 sub.)	18·2 t	621	621
t.	Bouvines .	6610	293¾	58¼	23¼	8400 A'D.	La Seyne .	1892	1894	594,640	17¾	4	..	..	14½	..	2 12-in., 8 3·9-in., 4 1·8-in., 10 1·4-in. M.	2	16·05 t	300	323
t.	Brennus . .	11,395	361	67	26¾	14,000 B.	Lorient .	1891	1895	991,767	15¾ comp.	4	4¾ comp.	..	17¾ comp.	4¾ comp.	3 13·4-in., 10 6·4-in., 26 small Q.F. and M.	4	17·1 t	800	696
a.c.	Bruix . .	4754	365¼	46	19¾	9049 B.	Rochefort .	1894	1896	409,622	3¾–2¾	2	3¾	..	3¾	3¾	2 7·6-in., 6 5·5-in., 4 2·5-in., 4 1·8-in., 4 1·4-in., M.	4	18·3 t	406	391
t.	Caïman . .	7239	278¼	59	24½	6000	Toulon .	1885 1892	1887	..	19½	3	..	..	10 H.S.	..	2 10·8-in., 6 3·9-in., 10 1.8-in., 4 1·4-in., 2 M.,	4	14·5 t	400 / 800	332
t.	Carnot . .	12,008	382½	70½	27½	16,300 t D'A.	Toulon .	1894	1896	1,070,088	17¾–9 comp.	2¾	4	..	14½	4	2 12-in., 2 10·8-in., 8 5·5-in., 4 2·5-in., 16 1·8-in., 10 1·4-in.	4 (2 sub.)	17·86 t	705	625
a.c.	Chanzy . .	4933	348	46	19¼	8300 B.	Bordeaux .	1894	1896	360,000	3¾–2¾	2	3¾	..	3¾	3¾	2 7·6-in., 6 5·5-in., 4 2·5-in., 6 1·8-in., 6 1·4-in., M.	4	19·0	413	375
t.	Charlemagne .	11,275	385½	66½	27½	14,500 B.	Brest .	1895	1898	1,096,432	15¾ H.N.	3½	3 H.N.	..	15¾ H.N.	3 H.N.	4 12-in., 10 5·5-in., 8 3·9-in., 16 1·8-in., 10 1·4-in., 8 M.	4 (2 sub.)	18·1 t	680 / 1100	631
t.	Charles Martel.	11,880	392½	71	27½	14,996 t D'A.	Brest .	1893	1897	1,092,830	17¾	3½	4	..	15¾	4	2 12-in., 2 10·8-in., 8 5·5-in., 4 2·5-in., 14 1·8-in., 5 1.4-in.	6	18·1 t	677	632
a.c.	Charner . .	4792	348	46	19¼	8300 B.	Rochefort .	1893	1895	353,200	3¾–2¾	2	3¾	..	3¾	3¾	2 7·6-in., 6 6·5 in., 14 small Q.F. and M.	5	18·2 t	413	375
a.g.b.	Cocyte . .	1714	181¾	40¼	11¾	1700	Cherbourg	1887	1889	100,000	9½–6 comp.	2½	..	..	8 comp.	..	1 10·8-in., 2 3·9-in., 2 1·8-in., 4 M.	..	13·0	100	101
a.c.	Condé . .	10,014	453	63¾	24½	20,500 Nic.	Lorient .	1902	..	863,799	6–4 H.S.	2	5–2 H.S.	..	7½ H.S.	6½–5 H.S.	2 7·6-in., 8 6·4-in., 6 3·9-in, 16 1·8-in., 6 1·4-in.	5 (2 sub.)	21·0	970 / 1590	615
c.b. & b.	Courbet . .	10,808	312	67	25	8100 B.	Toulon .	1881 1899	1884	800,000	15–9	2½	..	12	9½	4½ shield.	4 10·8-in., 3 9·4-in, 1 6·4-in, 10 3·9-in., 14 1·8-in., 17 1·4-in.	5	15·4 t	1000	669
a.c.	De Gueydon .	9517	459	63¾	24½	20,200 Nic.	Lorient .	1899	..	817,994	6–3¾ H.S.	2	3¾ H.S.	6 H.S.	6 H.S.	3¾ H.S.	2 7·6-in., 8 6·4-in., 4 3·9-in., 16 1·8-in., 6 1·4-in.	2 (sub.)	21·0	1020 / 1600	610
t.	Démocratie .	14,927	438¾	79½	27½	18,000 W.T.	Brest .	1902	..	1,421,708	11–7 H.S.	2¾	8 H.S.	..	12 H.S.	6 H.S.	4 12-in, 10 7·6-in., 8 3·9-in., 16 1·8-in., 2 1·4-in.	5 (2 sub.)	18·0	905 / 1825	793
a.c.	Desaix . shd.	7700	426½	58¼	24¼	17,100 B.	St. Nazaire	1901	..	762,759	4–3 H.S.	2¾	..	..	3½ H.S.	..	8 6·4-in., 4 3·9-in., 10 1·8-in, 4 1·4-in.	2	21·0	880 / 1200	531
c.b. & b.	Dévastation .	10,704	312	67	25	8320 B.	Lorient .	1879 1901	1882	..	15–9	2½	..	12	9½	4½	4 10·8-in., 2 9·4-in., 14 3·9-in., 24 smaller Q.F., 14 M.	4	15·17 t	950	685
a.c.b.	Duguesclin shd.	6210	266	57	25¼	3300	Rochefort .	1883	1885	220,000	9 comp.	2	..	..	8 comp.	..	4 9·4-in., 1 7·6-in., 6 5·5-in., 1 3·5-in., 10 M.	2	14·0	400	430
b.	Duperré* . .	11,209	311	67	26¾	8120	La Seyne .	1879 1903	1882	570,000	21–10	2¼	..	..	12	6	3 13·3-in., 4 6·4-in., 1 5·5-in., 14 4-in., 42 small Q.F. and M.	4	14·22 t	850	664
a.c.	DupetitThouars	9517	452¾	63¾	24½	19,600 B.	Toulon .	1901	..	831,839	6 H.S.	2	3¾ H.S.	6 H.S.	6 H.S.	3¾ H.S.	2 7·6-in., 8 6·4-in., 4 3·9-in., 16 1·8-in., 6 1·4-in.	(2 sub.)	21·0	‡ 1020 / 1600	610
a.c.	Dupleix . shd.	7700	426½	58¼	24¼	17,100 B.	Rochefort .	1900	..	652,354	4–3 H.S	2¾	..	..	3½ H.S.	..	8 6·4-in., 10 1·8-in., 6 1·4-in.	2	21·0	880 / 1200	531
„	Dupuy de Lôme	6406	374	51½	26¾	14,000	Brest .	1890	1893	416,000	4	2	4	..	4	4	2 7·6-in., 6 6·4-in., 12 2·5-in. and 1·8-in., 8 M.	4	20·0	900	515
a.c.	Ernest Renan .	13,562	515	70½	26¾	38,000	..	Bdg.	..	..	..	..	..	..	..	..	2 9·4 in., 12 6·4-in. Q.F., 22 1·8-in.	5 (2 sub.)	23·0	2300	728
a.g.b	Flamme . .	1128	515	32½	10½	1500	Cherbourg	1885	1887	68,000	10–7	2	..	..	8	4	1 9·4-in., 1 3·5-in., 4 M. .	1	13·0	120	84
b.	Formidable .	12,165	321½	69½	26½	9700†	Lorient .	1885 1899	1888	467,520	14–10	3	..	..	16½	4½	2 10·8-in., 4 6·4-in, 8 5·5-in., 36 smaller.	6	16·0	900	640
c.b. & b.	Friedland .	8994	317	58	30	4428	Lorient .	1873	1876	..	8	..	..	6¼	7	..	8 10·8-in., 8 5·5-in., 20 M.	4	13·3 t	800	676

* Reconstruction of Duperré deferred. Intended new armament given.

† Has received new boilers.

‡ Including liquid fuel.

FRANCE.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			kts.	tons.	
c.d.s.,t.	**Fulminant** .	5965	248	57¾	21¼	4500	Cherbourg	1877	1879	..	13–10 *iron*	2	12 *iron*	12 *iron*	12 *iron*	..	2 *10·8-in.*, 4 *1·8-in.*, 6 M. .	2	13·8 *t*	400	248
c.d.s., b.	**Furieux*** . .	6019	248	59	21¾	5033 Nic.	Cherbourg	1883 1903	1885	264,640	20–13 *comp.*	3½	..	..	9 K.S.	..	2 *9·4-in.*, 5 Q.F., 10 M.† .	2	14·0	290	248
a.g.b.	**Fusée** . shd.	1142	165	32½	10¼	1500	Lorient .	1884	1886	68,000	10–7 *comp.*	2	..	..	4 *comp.*	..	1 *9·4-in.*, 1 *3·5-in.*, 4 M. .	1	13·0	120	84
t.	**Gaulois** . .	11,275	385½	66½	27½	14,500 B.	Brest .	1896	1898	1,093,925	15¾ H.N.	3½–1½	3 H.N.	..	15¾ H.N.	3 H.N.	4 *12-in.*, 10 *5·5-in.*, 8 *3·9-in.*, 16 *1·8-in.*, 10 *1·4-in.*, 8 M.	6 (2 sub.)	18·0	680/1100	632
a.c.	**Gloire** . .	10,014	453	63¾	24½	20,500 Nic.	Lorient .	1900	..	883,269	6–4 H.S.	2	5–2 H.S.	..	7½ H.S.	6½–5 H.S.	2 *7·6-in.*, 8 *8·4-in.*, 6 *3·9-in*, 16 *1·8-in.*, 6 *1·4-in.*	5 (2 sub.)	21·0	970/1590	615
a.g.b.	**Grenade** . shd.	1089	165	32½	10¼	1500	Lorient .	1888	1890	68,000	10–7	2	..	..	8	4	1 *9·4-in.*, 1 *3·5-in.*, 4 M. .	1	13·0	120	84
t.	**Henri IV.** .	8948	354½	72	23	11,500 Nic.	Cherbourg.	1899	..	801,248	11–7 H.S.	3	4¾ H.S.	..	11¾ H.S.	5 H.S.	2 *10·8-in.*, 7 *5·5-in.*, 12 *1·8-in.*, 2 M.	2 (sub.)	17·0	735/1100	464
t. & b.	**Hoche** . .	10,997	333	65½	27¼	11,300 B.	Lorient .	1886 1900	1889	700,000	18–14 *comp.*	3	3 bow	..	16 *comp.*	..	2 *13·4-in.*, 2 *10·8-in.*, 12 *5·5-in.*, 4 *2·5-in.*, 9 *1·8-in.*, 12 *1·4-in.*, 8 M.	5	16·0	800	660
t.	**Iéna** . .	12,052	400¾	68¼	27½	16,500 *t* B.	Brest .	1898	1901	1,111,340	13¾–6 H.S.	2½	5–4 H.S.	..	..	4 H.S.	4 *12-in.*, 8 *6·4-in.*, 8 *3·9-in.*, 16 *1·8-in.*, 5 *1·4-in*, 13 *1·4-in.* M.	4 (2 sub.)	18·2 *t*	820/1100	631
t.	**Indomptable** .	7583	279¾	59	23½	6605 Nic.	Lorient .	1883 1902	1886	..	19½ *comp.*	3	..	..	10 H.S.	..	2 *10·8-in.*, 6 *3·9-in.*, 10 *1·8-in.*, 4 *1·4-in.*, 2 M.	4	14·8 *t*	400/800	332
t.	**Jauréguiberry** .	11,824	364	72¾	27¾	15,800 D'A.	La Seyne .	1893	1896	1,069,536	17¾	2¾	4	..	14½	4	2 *12-in.*, 2 *10·8-in.*, 8 *5·5-in*, 4 *2·5-in.*, 12 *1·8-in.*, 8 *1·4-in.*, 8 M.	6	18·07 *t*	700	625
a.c.	**Jeanne d'Arc** .	11,329	477½	63¾	26½	28,000 Guyot	Toulon .	1899	..	875,847	6–3 H.S.	2·2	3 H.S.	..	6 H.S.	5 H.S.	2 *7·6-in.*, 8 *5·5-in.*, 10 *3·9-in.*, 16 *1·8-in.*, 8 *1·4-in.*, 2 M.	2 (sub.)	23·0	1400/2100	626
c.d.s.,t.	**Jemmapes** .	6592	284	57¾	22	9250 D'A.	St. Nazaire	1892	1894	525,000	17¾–10	4–2¾	..	..	17¾	..	2 *13·4-in.*, 4 *3·9-in.*, 4 *1·8-in.*, 10 *1·4-in.*, M.	2	16·7 *t*	300	334
a.c.	**Jules Ferry** .	12,550	480½	70¼	27	26,000 Guyot	Cherbourg	Bldg.	..	1,169,940	6–4 H.S.	2	5–3 H.S.	..	5 H.S.	5 H.S.	4 *7·6-in.*, 16 *6·4-in.*, 20 *1·8-in.*, 4 *1·4-in.*	5 (2 sub.)	21·0	1320/2100	728
a.c.	**Jules Michelet.**	12,570	480½	70¼	27	27,500 W.T.	Lorient .	Bldg.	..	1,183,800	6¾ H.S.	2½	..	..	..	..	2 *9·4-in.*, 12 *6·4-in.*, 22 *1·8-in.*	5 (2 sub.)	23·0	1320/2100	728
t.	**Justice** . .	14,927	438¾	79½	27½	18,000 W.T.	St. Nazaire	Bldg.	..	1,421,708	11–7 H.S.	2¾	8 H.S.	..	12 H.S.	6 H.S.	4 *12-in.*, 10 *7·6-in.*, 8 *3·9-in.*, 16 *1·8-in.*, 2 *1·4-in.*	5 (2 sub.)	18·0	905/1825	793
a.c.	**Kléber** . shd.	7700	426½	58¼	24¼	18,000 Nic.	Bordeaux .	1902	..	770,320	4–3 H.S.	2¾	..	..	3½ H.S.	..	8 *6·4-in.*, 10 *1·8-in.* 6 *1·4-in.*	2	21·0	880/1200	531
a.c.	**Latouche - Tréville**	4756	348	46	19¼	8300 B.	Havre .	1892	1893	360,000	3¾–2¾	2	3¾	..	3¾	3¾	2 *7·6-in*, 6 *5·5-in.*, 4 *2·5-in*, 4 *1·8-in.*, 6 *1·4-in.*, M.	4	18·2 *t*	406	375
a.c.	**Léon Gambetta**	12,550	480½	70¼	27	26,000 Nic.	Brest .	1901	..	1,169,940	6–4 H.S.	2	5–3 H.S.	..	5 H.S.	5 H.S.	4 *7·6-in.*, 16 *6·4-in.*, 20 *1·8-in.*, 4 *1·4-in.*	5 (2 sub.)	22·0	1320/2100	728
t.	**Liberté** . .	14,927	431¾	79½	27½	18,000 W.T.	La Seyne .	Bldg.	..	1,421,708	11 H.S.	..	8 H.S.	..	12 H.S.	6 H.S.	4 *12-in.*, 10 *7·6-in.*, 8 *3·9-in.*, 16 *1·8-in.*, 2 *1·4-in.*	5 (2 sub.)	18·0	905/1825	793
b.	**Magenta** . .	10,851	330	65½	27¼	12,000	Toulon .	1890 1901	1893	760,960	18–12	3	..	..	16	2 screen.	4 *13·4-in.*, 17 *5·5-in.*, 4 *2·5-in.*, 12 *1·8-in.*, 8 M.	3	16·25 *t*	800	660
b.	**Marceau** . .	10,850	330	65½	27¼	14,000 Nic.	La Seyne .	1887 1901	1890	769,080	18	3	..	..	16	2 screen.	4 *13·4-in.*, 17 *5·5-in.*, 4 *2·5-in.*, 12 *1·8-in.*, 8 M.	6	16·4 *t*	800	660
a.c.	**Marseillaise** .	10,014	453	63¾	24½	20,500 B.	Brest .	1902	..	881,270	6–4 H.S.	2	5–2 H.S.	..	7½ H.S.	6½–5 H.S.	2 *7·6-in.*, 8 *6·4-in.*, 6 *3·9-in.*, 2 *2·5-in.*, 18 *1·8-in.*, 6 *1·4-in.*	4 (2 sub.)	21·0	970/1590	615
t.	**Masséna** . .	11,924	384¾	66	27	13,500 D'A.	St. Nazaire	1895	1898	1,100,400	17¾–9¾	3½	4 H.S.	16	15¼15¾ H. S.	4	2 *12-in.*, 2 *10·8-in.*, 8 *5·5-in.*, 8 *3·9-in.*, 12 *1·8-in.*, 12 *1·4-in.*	6 (2 sub.)	17·1 *t*	630	642
a.g.b.	**Mitraille** . shd.	1128	165	32½	10½	1500	Rochefort	1886	1888	70,000	10–7 *comp.*	2	..	..	4 *comp.*	..	1 *9·4-in.*, 1 *3·5-in.*, 4 M.	..	13·0	120	84
a.c.	**Montcalm** . .	9517	452¾	63¾	24½	19,600 N.S.	La Seyne .	1900	1902	902,809	6 H.S.	2	3¾ H.S.	6 H.S.	6 H.S.	2¾ H.S.	2 *7·6-in.*, 8 *6·4-in.*, 4 *3·9-in.*, 16 *1·8-in.*, 6 *1·4-in.*	2 (sub.)	21·0	‡ 1020/1600	612
b.	**Neptune*** . .	10,983	330	65½	27¼	12,000 B.	Brest .	1887 1903	1892	780,000	18	3	..	..	16	2 screen.	4 *13·4-in.*, 17 *5·5-in.*, 4 *5·5-in*, 12 *1·8-in.*, 8 M.	5	16·02 *t*	800	660
t.	**Patrie** . .	14,927	438¾	79½	27½	18,000 W.T.	La Seyne .	Bldg.	..	1,421,708	11–7 H.S.	2¾	8 H.S.	..	12 H.S.	6 H.S.	4 *12-in*, 18 *6·4-in.*, 26 *1·8-in.*, 2 *1·4-in.*	5 (2 sub.)	18·0	905/1825	793
a.g.b.	**Phlégéton** . .	1796	187	40¼	11¾	1700	Cherbourg	1890	1892	142,000	9–6 *comp.*	2	..	..	8 *comp.*	..	1 *10·8-in*, 1 *5·5-in.*, 4 *1·8-in.*, 4 M.		12·4 *t*	72	101
a.c.	**Pothuau** . .	5360	370½	50¼	21	10,398 B.	Havre .	1895	1896	384,000	3⅛–2	3⅜	2½	..	9½	5½	2 *7·6-in.*, 10 *5·5-in.*, 16 *1·8-in.*, 8 *1·4-in.*	..	19·2 *t*	538	461
c.b. & b.	**Redoutable** .	9437	318¼	64¾	25½	6071	Lorient .	1876 1896	1879	..	14–9	2½	..	9½	9½	..	4 *10·8-in.*, 4 *9·4-in.*, 6 *3·9-in.*, 14 *1·8-in.*, 12 M.	4	14·66 *t*	1000	700

* Reconstruction of Furieux and Neptune deferred. † Intended new armament. ‡ Including liquid fuel.

FRANCE.—Armoured Ships—*continued*.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons	
t.	**République**	14,927	438¾	79½	27½	18,000 N.	Brest	1902	..	1,421,708	11–7 H.S.	2¾	8 H.S.	..	12 H.S.	6 H.S.	4 *12-in.*, 18 *6·4-in.*, 26 *1·8-in.*, 2 *1·4-in.*	5 (2 sub.)	18·0	905 / 1825	793
b.	**Requin**	7000	279¾	59	24½	7000 Nic.	Bordeaux	1885 1902	1888	..	19½ *comp.*	3	..	..	10 H.S	..	2 *10·8-in.*, 6 *3·9-in.*, 10 *1·8-in.*, 4 *1·4-in*, 12 M.	4	15·0	400 / 800	332
t.	**Saint Louis**	11,275	385½	66½	27½	14,500 B.	Lorient	1896	1900	1,080,997	15¾ H.N.	3½	3 H.N.	..	3–15¾ H.N.	3 H.N.	4 *12-in.*, 10 *5·5-in.*, 8 *3·9-in.*, 16 *1·8-in.*, 10 *1·4-in.*, 8 M.	4 (2 sub.)	18·0	820 / 1150	631
a.g.b.	**Styx**	1796	187	40¼	11¾	1700	Cherbourg	1892	1893	142,000	9–6 *comp.*	2	..	..	8 *comp.*	..	1 *10·8-in.*, 1 *5·5-in.*, 4 *1·8-in.*, 4 M.	..	13·0	72	101
t.	**Suffren**	12,728	411¾	70¼	27½	16,500 Nic.	Brest	1899	1902	1,195,564	12–8 H S.	2¾	5–3 H.S.	..	12 H.S.	6–5 H.S.	4 *12-in.*, 10 *6·4-in*, 8 *3·9-in.*, 20 *1·8-in.*, 2 *1·4-in.*	4 (2 sub.)	18·0	1100 / 1820	615
a.c.	**Sully**	10,014	453	63¾	24½	20,000 B.	La Seyne	1901	..	954,536	6–4 H.S.	2	5½–2 H.S.	..	7½ H.S.	6½–5 H.S.	2 *7·6-in.*, 8 *6·4-in.*, 6 *3·9-in.*, 16 *1·8-in.*, 6 *1·4-in.*	5 (2 sub.)	21·0	970 / 1590	..
c.d.s., t.	**Tempête**	4869	248	57¾	16¾	2193	Brest	1876	1879	..	13–10 *iron*	2	12 *iron*	12 *iron*	12 *iron*	..	2 *10·8-in.*, 4 *1·8-in.*, 6 M.	2	11·7 *t*	200	197
b.	**Terrible**	7575	279¾	59	24½	6230	Brest	1881 1902	1884	..	19½ *comp.*	3	..	..	10 H.S.	..	2 *13·4-in*, 6 *3·9-in.*, 10 *1·8-in.*, 4 *1·4-in.*	4	14·5 *t*	400 / 800	332
c.d.s., b.	**Tonnant**	5091	248½	58½	17¼	1935	Rochefort	1880	1882	..	18–14 *comp.*	3	..	..	14½ *comp.*	..	2 *13·4-in.*, 8 M.	..	11 5	200	197
c.d.s., t.	**Tonnerre**	5858	248	57¾	21¼	4165	Toulon	1175	1877	..	13–10 *iron*	2	12 *iron*	12 *iron*	12 *iron*	..	2 *10·8-in.*, 4 *1·8-in.*, 6 M.	2	14·01 *t*	400	249
t.	**Tréhouart**	6629	293¼	58¼	23¼	8500 B.	Lorient	1893	1896	593,100	17¾	4	..	..	14½	..	2 *12-in.*, 8 *3·9-in*, 4 *1·8-in.*, 4 *1·4-in.*, 8 M.	2	15·76 *t*	300	337
c.d.s., t.	**Valmy**	6592	293¾	57¼	23¼	8954	St. Nazaire	1892	1895	578,957	17¾	4	..	..	17¾	..	2 *13·4-in.*, 4 *3·9-in.*, 4 *1·8-in.*, 10 M.	2	16·7 *t*	300	297
a.c.	**Vauban**	6208	267¾	57	24	4560	Cherbourg	1882	1885	..	9 *comp.*	2	..	..	8 *comp.*	..	4 *9·4-in.*, 1 *7·6-in.*, 6 *5·5-in.*, 12 M.	2	14·32 *t*	550	440
c.d.s., t.	**Vengeur**	4709	248	57¾	16	2030	Cherbourg	1878	1880	..	13–10 *iron*	2	12 *iron*	12 *iron*	12 *iron*	..	2 *12·5-in.*, 4 *1·8-in.*, 6 M.	2	10·83 *t*	200	107
t.	**Vérité**	14,927	438¾	79½	27½	18,000 W.T.	Bordeaux	1902	..	1,421,708	11–7	2¾	8 H.S.	..	12 H.S.	6 H.S.	4 *12-in.*, 10 *7·6-in.*, 8 *3·9-in.*, 16 *1·8-in.*, 2 *1·4-in.*	5 (2 sub.)	18·0	905 / 1825	793
a.c.	**Victor Hugo**	12,550	480½	70¼	27	27,500 W.T.	Lorient	Bldg.	..	1,169,940	6–4 H S.	2	5–3 H.S.	..	5 H.S.	5 H.S.	4 *7·6-in.*, 16 *6·4-in.*, 22 *1·8-in.*, 2 *1·4-in.*	5 (2 sub.)	22·0	1320 / 2100	728

FRANCE.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
2nd cl. *cr.*	**Alger**	4382	346	45¼	19½	8254 B.	Cherbourg	1889	1893	280,000	3½	..	4 *6·4-in.*, 6 *5·5-in.*, 10 smaller, 10 M.	4	19·61 *t*	860	325
g. v.	**Aspic**	476	145¼	23¾	10½	453	Rochefort	1880	1881	..	..	..	2 *5·5-in.*, 2 *3·9-in.*	..	10·3 *t*	50	80
to. g. b.	**Bombe**	420	196¾	21½	5¾	2000 D'A.	Havre	1885	1886	..	..	..	4 *1·8-in.*, 3 M.	2	18·0	100	63
2nd cl. *cr.*	**Bugeaud**	3740	308½	43½	20½	9000 B.	Cherbourg	1893	1896	308,650	3	2 shield	6 *6·4-in.*, 4 *3·9-in.*, 8 *1·8-in.*, 11 *1·4-in.*	6	18·9 *t*	587	358
g. v.	**Capricorne**	483	148¼	23¾	10¼	443	Havre	1882	1883	..	..	..	2 *5·5-in.*, 2 *3·9-in.*	..	11·18 *t*	70	80
to. g. b.	**Casabianca**	960	262½	26¾	11½	5200 D'A.	Bordeaux	1895	1896	98,985	½	..	1 *3·9-in.*, 3 *2·5-in.*, 5 *1·8-in.*, 4 *1·4-in.*	..	22·0	116	143
2nd cl. *cr.*	**Cassard**	3952	325½	45	20½	10,143 D'A.	Cherbourg	1896	1898	318,712	3	2 shield	6 *6·4-in.*, 4 *3·9-in.*, 10 *1·8-in.*, 3 *1·4-in.*, 2 M.	2	19·8 *t*	630	385
to. g. b.	**Cassini**	958	262½	27¼	11½	5500 D'A.	Bordeaux	1894	1894	98,500	½	..	1 *3·9-in.*, 3 *2·5-in.*, 4 *1·4-in.*	2	21·2 *t*	110	118
2nd cl. *cr.*	**Catinat** shd.	4065	331¾	44½	21	9000 B.	Havre	1896	1897	324,992	3	2 shield	4 *6·4-in.*, 10 *3·9-in.*, 10 *1·8-in.*, 4 *1·4-in.* M.	2	19·0	563	384
2nd cl. *cr.*	**Cécille**	5933	378¾	49¼	19¾	10,200	La Seyne	1888	1890	299,666	4	..	8 *6·4-in.*, 10 *5·5-in.*, 6 *1·8-in.*, 14 M.	4	19·0	940	486
2nd cl. *cr.*	**Chasseloup-Laubat**	3758	308½	43½	20¾	9000 D'A.	Cherbourg	1893	1894	256,320	3	..	6 *6·4-in.*, 4 *3·9-in.*, 8 *1·8-in.*, 12 *1·4-in.*, M.	6	19·25 *t*	587	358
1st cl. *cr.*	**Châteaurenault** shd.	8018	442¾	55¾	24½	24,300 *t* N.S.	La Seyne	1898	1902	606,656	2½	2 shield	2 *6·4-in.*, 6 *5·5-in.*, 10 *1·8-in.*	..	24·19 *t*	1400 / 2100	625
3rd cl. *cr.*	**Coëtlogon**	1932	312	30¼	14	5800	St. Nazaire	1889	1894	134,000	1½	..	4 *5·5-in.*, 3 other Q.F., 4 M.	5	19·3 *t*	200	190
g. v.	**Comète**	495	151½	24¾	10½	631	Cherbourg	1884	1885	..	..	..	2 *5·5-in.*, 2 *3·9-in.*, 2 M.	..	12·2 *t*	60	84
o. cr.	**Condor**	1243	216½	29¼	15¼	3300	Rochefort	1885 1896	1886	80,000	1½	..	5 *3·9-in.*, 1 *2·5-in.*, 6 M.	5	17·7 *t*	160	134

FRANCE.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
3rd cl. *cr.*	Cosmao	1954	312	30½	14	6000	Bordeaux	1888	1890	133,000	1½	..	4 5·5-*in.*, 8 other Q.F., 4 M.	5	20·5 *t*	200	190
to. g. b.	Couleuvrine	435	196¾	21½	6	2047	Havre	1885	1886	33,778	..	..	4 1·8-*in.*, 3 M.	2	18·0	100	63
to. g. b.	Dague	408	196¾	21½	6	2000	Havre	1885	1886	36,119	..	..	4 1·8-*in.*, 3 M.	2	18·0	100	63
2nd cl. *cr.*	D'Assas	4000	325½	45	20½	9500 D'A.	St. Nazaire	1896	1898	292,682	3	2 sh'eld	6 6·4-*in.*, 4 3·9-*in.*, 10 1·8-*in.*, 11 1·4-*in.*	2	19·25 *t*	630	393
2nd cl. *cr.*	Davout	2291	295¼	40	17½	9000 Nic.	Toulon	1890	1902	221,827	3	..	6 6·4-*in.*, 4 3·9-*in.*, 4 2·5-*in.*, 4 1·8-*in.*, 6 M.	4	20·07 *t*	600	336
g. v.	Décidée	645	184¾	26¼	12¼	1000 Nic.	Lorient	1899	1900	54,100	..	..	2 3·9-*in.*, 4 2·5-*in.*, 4 1·4-*in.*	..	13·0	99	99
1st cl. *cr.*	D'Entrecasteaux shd.	8114	383½	58½	25¾	13,500	La Seyne	1896	1898	667,740	4	10–3 H.S.	2 9·4-*in.*, 12 5·5-*in.*, 12 1·8-*in.*	6	19·2 *t*	650	521
2nd cl. *cr.*	Descartes shd.	3990	326	42¼	21¾	9000 B.	St. Nazaire	1894	1896	334,725	1½	..	4 6·4-*in.*, 10 3·7-*in.*, 8 1·8-*in.*, 4 1·4-*in.*	2	21·0 *t*	552	386
cr.	D'Estaing	2435	262½	37½	18¾	3700	Brest	1879	1881	84,718	..	..	15 5·5-*in.*, 8 M.	..	15·31 *t*	300	264
3rd cl. *cr.*	D'Estrées shd.	2452	311¾	39¼	17¾	8500 Nor.	Rochefort	1897	1900	208,200	1½	..	2 5·5-*in.*, 4 3·9-*in.*, 8 1·8-*in.*, 2 1·4-*in.*	..	20·5 *t*	345/480	234
to. g. b.	D'Iberville	967	262½	27	11¼	5060 D'A.	St. Nazaire	1893	1894	99,120	½	..	1 3·9-*in.*, 1 2·5-*in.*, 4 1·4-*in.*	6	21·4 *t*	117	118
to. g. b.	Dragonne	410	196¾	21½	6	2000	Havre	1885	1886	36,074	..	..	4 5·5-*in.*, 3 M.	2	18·0	100	63
2nd cl. *cr.*	Du Chayla shd.	3952	325½	45	20½	10,009 D'A.	Cherbourg	1895	1897	315,835	3	2 shi ld	6 6·4-*in.*, 4 3·9-*in.*, 10 1·8-*in.*, 3 1·4-*in.*, 2 M.	2	20·2 *t*	624	385
to. g. b.	Dunois	896	256	27¾	12¾	7000 N.S.	Cherbourg	1897	1898	123,383	..	..	6 2·5-*in.*, 6 1·8-*in.*	..	23·0	137	128
cr.	Éclaireur	1769	236½	35½	17	2050	Toulon	1877	1878	16,232	..	..	8 5·5-*in.*, 6 M.	..	15·0	200	195
to. cr.	Epervier	1288	216½	29¼	15½	3200	Rochefort	1885	1887	80,000	1½	..	5 3·9-*in.*, 1 2·5-*in.*, 6 M.	5	17·6 *t*	160	134
to. cr.	Faucon	1239	216½	29¼	15½	3200	Toulon	1887	1888	80,000	1½	..	5 3·9-*in.*, 1 2·5-*in.*, 6 M.	5	18·0	150	134
to. g. b.	Flèche	425	196¾	21½	6	200	Havre	1885	1886	37,517	..	..	4 1·8-*in.*, 3 M.	2	18·0	100	63
3rd cl. *cr.*	Fleurus	1310	229¾	29¼	15¼	4000 Nic.	Cherbourg	1893	1898	128,530	..	..	5 3·9-*in.*, 6 1·8-*in.*, 4 M.	..	17·6 *t*	118	179
3rd cl. *cr.*	Forbin	1820	312	30½	16	5700	Rochefort	1888	1900	123,739	1½	..	4 5·5-*in.*, 8 other Q.F., 4 M.	5	20·6	200	190
3rd cl. *cr.*	Forfait	2464	249½	38	18	2764	Toulon	1879	1880	77,019	..	..	15 5·5-*in.*, 8 M.	..	13·44	400	264
cr.	Foudre (torpedo transport)	6090	370½	52½	23½	11,900 D'A. *t*	Bordeaux	1895	1897	407,712	3½	..	10 3·9-*in.*, 4 2·5-*in.*, 4 1·4-*in.*	..	19·9 *t*	840	410
2nd cl. *cr.*	Friant	3739	308½	43½	20¾	9000 Nic.	Brest	1893	1894	308,750	3	..	6 6·4-*in.*, 4 3·9-*in.*, 8 1·8-*in.*, 6 1·4-*in.*	2	18·19	587	358
g. v.	Fulton	913	199½	28½	12¾	850	Lorient	1887	1888	37,000	..	..	2 5·5-*in.*, 1 3·9-*in.*, 5 M.	..	13·0	160	116
3rd cl. *cr.*	Galilée	2317	330½	34½	17¾	6600 B.	Rochefort	1896	1897	208,152	1½	2 shield	4 5·5-*in.*, 2 3·9-*in.*, 8 1·8-*in.*, 8 1·4-*in.*	..	20·0	226	248
1st cl. *cr.*	Guichen shd.	8277	436½	51¾	24½	24,000 D'A.	St. Nazaire	1897	1902	611,945	2½	2 sh'eld	2 6·4-*in.*, 6 5·5-*in.*, 10 1·8-*in.*	..	23·0	1460	625
3rd cl. *cr.*	Infernet shd	2452	311¾	39¼	15½	8500 Nor.	Bordeaux	1899	1900	193,000	..	..	2 5·5-*in.*, 4 3·9-*in.*, 8 1·8-*in.*	..	20·5	345/480	234
2nd cl. *cr.*	Isly	4477	346	43½	19½	8100	Brest	1891	1892	252,760	3	..	4 6·4-*in.*, 6 5·5-*in.*, 14 2·5-*in.* and 1·8-*in.*, 8 M.	5	18·3	880	332
2nd cl. *cr.*	Jurien de la Gravière shd.	5685	440	48¾	22	17,000 Guyot	Lorient	1899	1901	475,979	3	..	8 6·4-*in.*, 12 1·8-*in.*	2	22·9 *t*	600/900	511
2nd cl. *cr.*	Jean Bart *	4109	346	43½	19½	8000	Rochefort	1889	1891	283,240	4	..	4 6·4-*in.*, 6 5·5-*in.*, 14 2·5-*in.* and 1·8-*in.*, 8 M.	5	19·0	940	332

* To receive Niclausse W.T. boilers, for 10,000 I.H.P.

FRANCE.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in			knots.	tons.	
g. v.	**Kersaint** . shd.	1243	226	31½	15	2200	Rochefort	1897	1898	107,933	..	..	1 *5·5-in.*, 5 *3·9-in.*, 7 *1·4-in.*	..	15·0	199	110
to. g. b.	**La Hire**	896	256	27¾	12¼	7000 N.S.	Cherbourg	1898	1899	123,383	..	..	6 *2·5-in.*, 6 *1·8 in.*	..	23·0	137	128
3rd cl. *cr.*	**Lalande**	1926	311½	31¼	14	6000	Bordeaux	1888	1900	133,800	1½	..	6 *5·5 in.*, 8 other Q.F., 4 M.	5	22·0	200	190
to. g. b.	**Lance**	402	196¾	21½	5¼	2000 Du T.	Havre	1886	1887	39,964	..	..	4 *1·8-in.*, 3 M.	2	18·0	100	63
3rd cl. *cr*	**Lavoisier**	2317	330¼	34½	17¾	6400 B.	Rochefort	1897	1899	202,024	1½	2 shield	4 *5·5-in.*, 2 *3·9-in.*, 8 *1·8-in.*, 2 *1·4-in.*, 4 M.	2	20·0	226	248
to. g. b.	**Léger**	517	197	23	10½	2360 B.	Lorient	1891	1892	52,000	..	..	1 *3·9-in.*, 3 *2·5-in.*, 4 *1·4-in.*	3	18·8 *t*	130	69
to. g. b.	**Lévrier**	505	197	23	10½	2210 B.	Lorient	1891	1892	52,000	..	..	1 *3·9-in.*, 3 *2·5-in.*, 4 *1·4-in.*	3	18·5 *t*	130	69
3rd cl. *cr*	**Lincis**	2345	321½	34½	17½	6600	La Seyne	1894	1895	163,014	1½	3·9 shield	4 *5·5 in.*, 2 *3·9-in.*, 8 *1·8-in.*, 4 *1·4-in.*, 4 M.	4	20·5 *t*	200	218
g. v.	**Lion**	503	151½	24¾	10½	576	Havre	1884	1885	23,146	..	..	2 *5·5-in.*, 4 M.	..	11·8 *t*	70	84
3rd cl. *cr.*	**Milan**	1733	30[illegible]¼	32¾	14½	3986 B.	St. Nazaire	1886	1888	89,058	..	..	5 *3·9-in.*, 8 M.	2	18·1 *t*	400	186
3rd cl. *cr.*	**Naiade** . shd.	3686	246	47½	22¾	2700	Toulon	1881	1883	128,275	..	..	2 *6·4-in.*, 18 *5·5-in.*, 10 M.	..	13·68 *t*	500	490
2nd cl. *cr.*	**Pascal**	4015	326	42¼	21½	9000 *t*, B.	Toulon	1895	1897	322,321	1½	..	4 *6·4-in.*, 10 *3·9-in.*, 8 *1·8-in.*, 4 *1·4-in.*, M.	2	20·0 *t*	650	378
2nd cl. *cr.*	**Protet** . shd.	4055	331¾	44¾	21	9300	Bordeaux	1898	1900	324,992	2½	2 shield	4 *6·4-in.*, 10 *3·9-in.*, 10 *1·8-in.*, 2 *1·4-in.*	2	20·2 *t*	563	384
to. g. b.	**Sainte Barbe**	437	196¾	21½	6	2000	Rouen	1885	1886	43,233	1½	..	4 *1·8-in.*, 3 M.	2	18·0	100	63
to. g. b.	**Salve**	413	196¾	21½	6	2000	Rouen	1886	1887	42,538	1½	..	4 *1·8-in.*, 3 M.	2	18·0	100	63
g. v.	**Scorpion**	505	151½	24¾	10½	511	Havre	1883	1884	23,459	..	..	2 *5·5-in.*, 3 M.	..	11·0	70	84
2nd cl. *cr.*	**Sfax**	4728	288¾	49¼	24¾	6522	Brest	1884 1898	1886	200,000	1½	..	6 *6·4-in.*, 10 *5·5-in.*, 6 *1·8-in.*, 6 *1·4-in.*, 4 M.*	2	16·84 *t*	715	473
2nd cl. *cr.*	**Suchet**	3440	318¼	43½	17½	9000	Toulon	1893	1895	226,360	3	..	4 *6·4-in.*, 4 *3·9-in.*, 4 *1·8-in.*, 8 *1·4-in.*, 6 M.	7	20·4 *t*	480	246
3rd cl. *cr.*	**Surcouf**	2044	312	30½	14	6000	Cherbourg	1888	1900	131,200	1½	..	4 *5·5-in.*, 8 other Q.F., 4 M.	5	20·5 *t*	200	190
g. v.	**Surprise**	627	184¾	24½	12¼	853 *t*	Havre	1895	1896	50,954	..	..	2 *3·9-in.*, 4 *2·5-in.*, 4 *1·4-in.*	..	13·4 *t*	73	99
1st cl. *cr.*	**Tage** . shd.	7589	390	53¾	22¾	12,410	St. Nazaire	1886	1888	93,857	..	..	8 *6·4-in.*, 10 *5·5-in.*, 2 *2·5-in.*, 6 smaller, 14 M.	7	19·0	1000	400
3rd cl. *cr.*	**Troude**	2026	311½	31¼	14	6000	Bordeaux	1888	1900	33,383	1½	..	4 *5·5-in.*, 8 smaller, 4 M.	5	20·9 *t*	200	190
to. g. b.	**Vautour**	1235	216½	29½	15½	3391	Toulon	1886	1888	87,733	1½	..	5 *3·9-in.*, 1 *2·5-in.*, 6 M.	5	17·3 *t*	150	134
g. v.	**Vipère**	486	145¼	23¾	10½	441	Rochefort	1881	1882	26,835	..	..	2 *5·5-in.*, 2 *3·9-in.*	..	10·3 *t*	60	80
to. g. b.	**Wattignies**	1292	230	29½	15	4189	Rochefort	1891	1892	111,000	..	..	5 *3·9-in.*, 6 *1·8-in.*, 7 *1·4-in.*, M.	4	18·61 *t*	160	180
g. v.	**Zélée**	646	185⅓	26	10½	1000 Nic.	Rochefort	1899	1900	..	..	..	2 *3·9-in.*, 4 *2·5-in.*, 4 *1·4-in.*	..	13·0	80	75

* New armament.

Shallow-draught gunboats Argus and Vigilante, launched at Chiswick (Thornycroft) 1900:—displacement, 122 tons; length, 145 ft.; beam, 24 ft.; draught, 2 ft.; 2 screws; 550 I.H.P.; 13 knots; 2 3·5-in., 4 1·4-in. Q.F. guns; complement, 30; coal capacity, 80. Transport despatch vessel Vaucluse, launched 1901.

Merchant Cruisers (Auxiliary to French Navy).

To what Company belonging.	Name.	Register Tonnage.	Length.	Beam.	Depth.	H.P. (nominal.)	Speed.	When built.
		Tons.	Feet.	Feet.	Feet.		Knots.	
Compagnie Générale Transatlantique	La Lorraine	11,869	563·1	60·0	35·9	2108	20	1900
	La Savoie	11,200	563·1	60·0	35·9	2108	20	1900
	L'Aquitaine	8810	500·0	57·3	34·0	1825	19	1890
	La Touraine	9047	520·2	56·0	34·6	1616	19	1890
	Duc de Bragance	2096	334·6	34·2	16·8	426	17½	1889
	Eugène Pereire	2078	334·6	35·1	23·9	437	17½	1888
	Général Chanzy	2299	341·2	35·7	15·5	478	17½	1891
	La Bretagne	7112	495·4	51·8	34·5	1149	17½	1886
	La Champagne	7087	493·4	51·8	34·5	1149	17½	1885
	La Gascogne	7395	495·4	52·2	34·8	1308	17½	1886
	Maréchal Bugeaud	2206	342·5	34·1	23·0	482	17½	1890
	Ville d'Alger	2211	342·7	36·1	23·0	208	17½	1890
	La Navarre	6648	471·0	50·5	36·4	983	17	1892
	La Normandie	6283	459·3	49·2	34·1	1147	16	1882
	Ville de Tunis	1966	317·3	34·6	16·8	444	15½	1884
	Moïse	1873	310·0	33·5	16·7	443	15	1880
	St. Augustin	1854	314·0	33·8	16·5	443	15	1880
	Versailles	4336	373·7	45·3	27·0	780	..	1882
	Ville de Madrid	1874	308·7	33·5	16·7	370	15	1880
	Ville de Naples	1879	311·6	34·1	16·7	506	15	1881
Messageries Maritimes	Armand Béhic	6635	486·6	50·1	36·8	821	17½	1892
	Australien	6570	482·3	49·2	34·1	818	17½	1889
	Polynésien	6569	482·3	49·2	34·1	818	17½	1890
	Ville de la Ciotat	6631	485·8	49·9	36·8	819	17½	1892
	Annam	6344	446·2	50·9	36·1	832	17½	1898
	Atlantique	6708	468·9	50·6	32·8	832	17½	1899
	Tonkin	6364	416·2	50·9	36·1	832	17½	1898
	Ernest Simons	4562	442·9	47·1	36·7	727	..	1893
	Indus	6357	446·2	50·8	36·1	417	..	1897
	Brésil	5876	463·9	46·4	32·5	743	16½	1889
	Chili	6375	462·6	47·6	36·7	719	..	1894
	Cordillère	6379	462·6	47·6	36·1	721	..	1895
	La Plata	5807	462·6	45·9	32·5	520	16½	1889

NOTE.—The armament for the larger ships is 7 5·5-in. and smaller quick-firers.

GERMANY.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
c. d. s.	Aegir*	3600	236½	50½	17¾	4800 T.	Kiel	1895	1897	233,500	9½ H. S.	2	..	..	8¾ H.S.	..	3 9·4-in., 10 3·4-in., 6 M.	3 (1 sub.)	14·8 t	225 †	276
b.	Baden	7370	321½	60	15½	6200 Dürr.	Kiel	1880 1897	1884	444,886	16	2¾	10	..	10	..	6 10·2-in., 8 3·4-in., 8 1·4-in., 1 l., 6 M.	5 (2 sub.)	14·0	700	376
a. g. b.	Basilisk	1109	154¼	36	10¼	759	Bremen	1878	1879	58,042	8	2	..	..	8	..	1 12-in., 2 3·3 in., 2 M.	2	9·0	40	76
b.	Bayern	7441	321½	60	19½	6326 Dürr.	Kiel	1878 1896	1882	406,660	16	3	10	..	10	..	6 10·2-in., 8 3·4-in., 8 1·4-in., 1 l., 6 M.	5 (2 sub.)	14·0	700	376
c. d. s.	Beowulf	4114	267	49¼	17¾	4800 T.S.	Bremen	1890 1902	1893	175,000	9½	1¼	..	..	8	..	3 9·4-in., 10 3·4-in., 7 M.	4	15·0	580 †	297
b.	Brandenburg	10,060	354¼	65	24½	9640	Stettin (Vulcan)	1891	1893	606,500‖	15¾ comp.	2½	..	..	11¾ comp.	1½	6 11-in., 6 4·1-in., 8 3·4-in., 12 1·4-in., 8 M., 2 l.	6	16·5 t	680 / 800	552
t.	Braunschweig	13,200	398½	73½	24½	16,000 T. S. & C.	Germania	1902	..	1,157,500	9–4 K. S.	3	6 K S.	..	10–6 K.S.	5½ K S.	4 11-in., 14 6·7-in., 12 3·4-in., 12 1·4-in., 8 M.	6 (5 sub.)	18·0	700 / 1600 §	660
a. g. b.	Biene	1109	154¼	36	10¼	759	Bremen	1876	1877	62,853											
a. g. b.	Camäleon	1109	154¼	36	10¼	759	Bremen	1878	1880	57,564	8	2	..	..	8	..	1 12-in., 2 3·3-in., 2 M.	2	10·0	40	76
,,	Crocodil	1109	154¼	36	10¼	759	Bremen	1879	1880	57,237											
b.	Deutschland	7650	280	62¼	24¼	5360	Poplar	1874 1895	1877	412,022	10	2	..	..	10	..	8 10·2-in., 7 5·9-in., 9 3·4-in., 12 M., 2 l.	5	14·5 t	710	668
a. c.	Deutschland (Ersatz)‡	9050	393½	65½	24¼	17,000 Dürr.	Hamburg	Bldg	..	875,000	9–4 K.S.	2	6 K S.	4 K.S.	6 K.S.	4 K.S.	4 8·2-in., 10 5·9-in., 12 3·4-in., 10 1·4-in., 4 M.	6 (3 sub.)	21·0	950	550
a. c.	Fürst Bismarck	10,650	393½	66½	26	14,000 Dürr.	Kiel	1897	1900	..	7¾ K. S.	3	..	..	7¾ K. S.	4 K.S.	4 9·4-in., 12 5·9-in., 10 3·4-in., 10 1·4-in., 8 M.	6 (5 sub.)	19·0	1500† / 1000†	565
c. d. s.	Frithjof*	3500	240	49¼	17¾	4800 T. S.	Bremen	1891	1892	175,000	9¼ H. S.	1¼	..	..	7¾ H. S.	..	3 9·4-in., 8 3·4-in., 6 M.	4	14·8	225	276

* In hand to be lengthened and reconstructed as Beowulf. † Also liquid fuel. ‡ Estimates, 1903. § And 200 tons "tar oil." ‖ Exclusive of armament.

GERMANY.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side abve Belt.	Bulkhead.	Gun Position.		Guns.	Torpedo Tubes.			
															Heavy Guns.	Secondary.					
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			kts.	tons.	
c. d. s.	Hagen	4114	267	49¼	17¾	5250 T.	Kiel.	1893 1900	1895	..											
c. d. s.	Heimdall	4114	267	49¼	17¾	4393 T. S.	Wilhelmshaven	1892 1902	1893	233,500	7 K.S.	1¼	..	..	7¾ H.S.	..	3 *9·4-in.*, 10 *3·4-in.*, 7 M.	4	15·0	580**	297
c. d. s.	Hildebrand	4114	267	49¼	17¾	4413 T. S	Kiel.	1892	1893	218,000											
a. g. b.	Hummel	1109	143	36	10½	759	Bremen	1881	1881	56,741	8	2	..	..	8	..	1 *12-in.*, 2 *3·3-in.*, 2 M.	2	10·0	40	76
t.	J. K. L. M.N.*	13,200	398½	73¾	24½	16,000 W.T.&C.	Danzig Stettin Germania ..	Bldg. Bldg. Bldg. Pro.	.. ..	1,157,500	9–4 K. S.	3	6 K.S.	..	10–6 K. S.	5½ K S.	4 *11-in.*, 14 *6·7-in.*, 12 *3·4-in.*, 12 *1·4-in.*, 8 M.	6 (5 sub.)	18·0	800 / 1600‖	660
b.	Kaiser	7650	292	62¼	24½	5700	Poplar	1874	1876	411,301	10	2	..	..	10	..	8 *10·2-in.*, 1 *5·9-in.*, 6 *4-in.*, 9 *3·4-in.*, 2 M., 2 l.	5	14·6 t	710	668
a. c.	Kaiser (Ersatz)	9500	396	64¼	25¼	16,000 Dürr.	Kiel.	Bldg	..	875,000	4 K.S.	2¾	4 K S.	..	6 K.S.	4 K.S.	4 *8·2-in.*, 10 *5·9-in.*, 12 *3·4-in.*, 10 *1·4-in.*, 4 M.	4 (3 sub.)	21·0	950 / 1500**	504
t.	Kaiser Barbarossa					13,000 C.&T.	Danzig	1900	1901												
t.	Kaiser Friedrich III.					13,000 C.&T.	Wilhelmshaven	1896	1898												
t.	Kaiser Wilhelm II.†	11,150	377¼	66¾	25½	13,000 C. T. & S.	Wilhelmshaven	1897	1900	962,500	11¾ H. N. S.	3	..	..	9¾ H. N. S.	6 H.N.S.	4 *9·4-in.*, 18 *5·9-in.*, 12 *3·3-in.*, 12 *1·4-in.*, 8 M	6 (5 sub.)	18·0	650 / 1000**	700
t.	Kaiser Wilhelm der Grosse					13,000 C. & T. S.	Germania.	1899	1901												
t.	Kaiser Karl der Grosse					13,000 C. & T. S.	Hamburg (Blohm & Voss)	1899	1901												
b.	König Wilhelm	9757	355	60	26½	8350	Blackwall.	1868 1896	1869	505,141	12–6	1½	..	..	6	..	20 *5·9-in.*, 18 *3·4-in.*, 8 M., 4 l.	5	14·7 t	700	759
b.	Kurfürst Friedrich Wilhelm.	10,060	354¼	65	24½	9959	Wilhelmshaven	1891	1893	653,000§	15¾ comp.	2½	..	..	11¾ comp.	1½	6 *11-in.*, 6 *4·1-in.*, 8 *3·4-in.*, 12 *1·4-in.*, 8 M., 2 l.	6	16·0	680 / 800	550

t.	Mecklenburg (F)	11,800	393¾	68¼	24¾	14,000 C. T. & S.	Stettin (Vulcan)	1901	..	1,061,250	9–4 K.S.	3	6 K.S.	..	10 K.S.	6 K.S.	4 *9·4-in.*, 18 *5·9-in.*, 12 *3·3-in.*, 12 *1·4-in.*, 8 M.	6 (5 sub.)	18·0	700 / 1450**	715
a. g. b.	Mücke	1109	154¼	36	10¼	759	Bremen	1877	1878	60,960	8	2	..	..	8	..	1 *12-in.*, 2 *3·3-in.*, 2 M.	2	10·0	40	76
a. g. b.	Natter	1109	154	36	10¼	759	Bremen	1880	1881	52,822											
c. d. s. b.	Odin	4114	267	49¼	17¾	4800 T.S.	Danzig	1894	1896	..	9½ H. S.	2	..	..	8¾ H. S.	..	3 *9·4-in.*, 10 *3·4-in.*, 6 M.	3 (1 sub.)	15·0	225**	266
b.	Oldenburg	5220	246	59	19½	3900	Stettin	1884	1887	235,342	12 comp.	1	..	..	8 comp.	..	8 *9·4-in.*, 2 *3·4-in.*, 6 M.	4	13·5 t	475	356
a. c.	Prinz Adalbert	9050	396	64¼	25¼	16,000 Dürr.	Kiel.	1901	..	885,000	3 K.S.	1½	3 K.S.	3 K.S.	6 K.S.	4 K.S.	4 *8·2-in.*, 10 *5·9-in.*, 12 *3·4-in.*, 10 *1·4-in.*, 4 M.	4 (3 sub.)	21·0	950 / 1500**	504
a. c.	Prinz Friedrich Karl	9050	393½	65½	24¼	17,000 Dürr.	Hamburg	1902	..	875,000	4 K.S.	2	6 K.S.	4 K.S.	6 K.S.	4 K.S.	4 *8·2-in.*, 10 *5·9-in.*, 12 *3·4-in.*, 10 *1·4-in.*, 4 M.	6 (3 sub.)	21·0	950 / 1500**	504
a. c.	Prinz Heinrich	8930	396	64¼	25¼	15,000 Dürr.	Kiel	1900	1902	730,000	4 K.S.	2½	4 K.S.	..	6 K.S.	4 K.S.	2 *9·4-in.*, 10 *5·9-in.*, 10 *3·4-in.*, 10 *1·4-in.*, 4 M.	4 (3 sub.)	20·0	950	528
b.	Sachsen	7441	321½	59	21	6000 Dürr.	Stettin	1877 1896	1878	422,178	15¾	3	10	..	15¾	..	6 *10·2-in.*, 8 *3·4-in.*, 8 *1·4-in.*, 1 l., 6 M.	5 (2 sub.)	14·0	700	376
t.	Schwaben (G)	11,800	393¾	68¼	24¾	14,000 C.&T.S.	Wilhelmshaven	1901	..	1,061,250	9–4 K.S.	3	6 K.S.	..	10–6 K.S.	6 K S.	4 *9·4-in.*, 18 *5·9-in.*, 12 *3·3-in.*, 12 *1·4-in.*, 8 M.	6 (5 sub.)	18·0	700 / 1450**	715
c. d. s.	Siegfried	4114	267	49¼	17¾	4800 T. S.	Germania.	1889	1890	175,000	9½	1¼	..	..	7¾	..	3 *9·4-in.*, 6 *3·4-in.*, 6 M.	4	14·8 t	225**	276
a. g. b.	Salamander	1109	154¼	36	10¼	759	Bremen	1880	1881	56,914											
,,	Skorpion	1109	154¼	36	10¼	759	Bremen	1877	1877	60,796											
,,	Viper	1109	154¼	36	10¼	759	Bremen	1876	1877	61,463	8	2	..	..	8	..	1 *12-in.*, 2 *3·3-in.*, 2 M.	2	10·0	40	76
,,	Wespe	1109	154¼	36	10¼	759	Bremen	1876	1878	53,771											
b.	Weissenburg	10,100	354¼	65	24¾	9000	Stettin (Vulcan)	1891	1893	659,475§	15¾	2½	..	..	11¾	1½	6 *11-in.*, 6 *4·1-in.*, 8 *3·4-in.*, 12 *1·4-in.*, 8 M., 2 l.	6	16·0	680 / 800	552
t.	Wettin	11,800	393¾	68¼	24¾	14,000 C.&T.S.	Schichau	1901	1902	1,071,250	9–4 K.S.	3	6 K.S.	..	10 K.S.	6 K S.	4 *9·4-in.*, 18 *5·9-in.*, 12 *3·3-in.*, 12 *1·4-in.*, 8 M.	6 (5 sub.)	18·0	700 / 1450**	715
t.	Wittelsbach						Wilhelmshaven	1900	1902	1,071,250											
b.	Wörth ‡	10,100	354¼	65	24½	10,224 (t)	Kiel.	1892	1894	595,250§	15¾	2½	..	..	11¾	1½	6 *11-in.*, 6 *4·1-in.*, 8 *3·4-in.*, 12 *1·4-in.*, 8 M., 2 l.	6	17·2	680 / 800	552
b.	Württemberg	7441	321½	60	19½	6000 T. S.	Stettin	1878 1898	1881	402,512	15¾	3	10	..	10	..	6 *10·2-in.*, 8 *3·4-in.*, 8 *1·4-in.*, 1 l., 6 M.	5 (2 sub.)	14·0	700	376
t.	Zähringen	11,800	393¾	68¼	24¾	15,000 C.&T.S.	Germania.	1901	1902	1,071,250	9–4 K.S.	3	6 K.S.	..	10 K.S.	6 K.S.	4 *9·4-in.*, 18 *5·9-in.*, 12 *3·3-in.*, 12 *1·4-in.*, 8 M.	6 (5 sub.)	19·0	650 / 1000**	715

The Arminius, Friedrich Carl, and Kronprinz are now used for harbour service.

* Estimates, 1903; M at Wilhelmshaven. † Kaiser Wilhelm II. specially fitted as fleet flagship to receive the Emperor, with a staff of 64. ‡ In hand for repairs and improvements. Kurfürst Friedrich Wilhelm, Brandenburg and Weissenburg to be put in hand also. § Exclusive of armament. ‖ And 200 tons "tar-oil." ** Also liquid fuel.

GERMANY.—Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
3rd cl. cr.	Alexandrine	2373	236¼	42½	18¼	2400	Kiel	1885	1886	102,877	..	..	10 5·9-in., 4 4·1-in., 10 M., 1 l.	1	14·0	300	267
" "	Amazone . shd.	2665	328	38½	16	8000 T.S.	Kiel (Germania)	1900	1901	247,000	2	..	10 4·1-in., 12 1·4-in., 4 M., 2 l.	2 (sub.)	21·5 t	560	249
" "	Arcona . shd.	2665	328	38½	16	8000 T.S.	Bremen (Weser)	1902	..	254,500	2	..	10 4·1-in., 12 1·4-in., 4 M., 2 l.	2 (sub.)	21·0	700	249
" "	Ariadne . shd.	2665	328	38½	16	8000 T.S.	" "	1900	1901	247,000	2	..	10 4·1-in., 12 1·4-in., 4 M., 2 l.	2 (sub.)	22·0	560	249
" "	Blitz	1382	246	32¾	13½	2839	Kiel	1882	1883	66,935	..	..	6 3·4-in., 4 M.	1	16·0	180	135
g. b.	Bremse	866	203½	27¾	10½	1500	Bremen	1884	1884	49,308	2½	..	1 8·2-in.	..	15·0	65	73
g. b.	Brummer (gunnery training)	866	203½	27¾	10½	1500	Bremen	1884	1884	52,422	2½	..	1 8·2-in.	..	15·0	65	73
3rd cl. cr.	Bussard	1857	256	30¼	18½	2900	Danzig	1890	1890	..	3	..	8 4·1-in., 7 M.	2	16·5 t	300	165
to. g. b.	Comet	946	262½	31¼	13¾	5000	Stettin	1892	1896	..	2	..	4 3·4-in., 2 M.	1	21·0 t	120	115
3rd cl. cr.	Condor	1640	246	33½	15	2930	Hamburg	1892	1892	..	3	..	8 4·1-in., 7 M.	2	16·5 t	300	165
3rd cl. cr.	Cormoran	1640	246	33½	15	2930	Danzig	1892	1893	..	3	..	8 4·1-in., 7 M.	2	16·0	300	165
" "	Falke	1731	246	33½	15	2900	Kiel	1891	1902	..	3	..	8 4·1-in., 7 M.	2	15·5 t	300	165
3rd cl. cr.	Frauenlob . shd.	2665	328	38½	16	8000 T.S.	Bremen (Weser)	1902	..	254,500	2	..	10 4·1-in., 12 1·4-in., 4 M., 2 l.	2 (sub.)	21·0	700	249
2nd cl. cr.	Freya	5650	344½	57	20¾	10,000 Nic	Danzig	1897	1898	..	4 N.S.	4 N.S.	2 8·2-in., 8 6-in., 10 3·4-in., 10 1·4-in., 4 M.	3 (sub.)	19·5 t	825	465
3rd cl. cr.	Gazelle . shd.	2650	328	38½	16¾	6400 Nic.	Kiel (Germania)	1898	1898	225,000	2	..	10 4·1-in., 12 1·4-in., 4 M., 2 l.	3 (1sub.)	18·0	560	210
2nd "	Gefion	4207	344½	42¾	20¾	9000	Danzig (Schichau)	1893	1894	..	1½	..	10 4·1-in., 6 2·1-in., 1 l., 8 M.	2	19·0	780	302
3rd "	Geier . shd.	1776	219¼	34¾	15½	2960	Wilhelmshaven	1894	1896	..	3	..	8 4·1-in., 7 M.	2	16·2 t	300	165
3rd cl. cr.	Greif	2000	318	32	14¾	5400	Kiel	1886	1887	..	..	..	2 8·4-in., 4 M.	..	19·0	350	170
g. v.	Habicht	848	174	29½	11½	600	Elbing	1879	1880	33,054	..	..	5 4·9-in., 5 M.	..	12·0	100	130
2nd cl. cr.	Hansa . shd.	5900	345½	57¾	21¾	10,000 B	Stettin (Vulcan)	1898	1899	..	4 N.S.	4 N.S.	2 8·2-in., 8 6-in., 10 3·4-in., 10 1·4-in., 4 M.	3 (sub.)	19·5	825	465
t. v.	Hela	2000	328	36	14¾	5860	Bremen	1895	1896	..	1½	..	4 3·4-in., 6 1·9-in., 2 M.	3	20·0	500	178
2nd cl. cr.	Hertha	5650	344½	57	21¾	10,000 B	Stettin (Vulcan)	1897	1898	..	4 N.S.	4	2 8·2-in., 8 6-in., 10 3·4-in., 10 1·4-in., 4 M.	3 (sub.)	19·5 t	825	465
g. b.	Iltis . shd.	895	203½	29¾	10¾	1300 T	Danzig (Schichau)	1898	1898	100,000	..	..	8 3·4-in., 6 1·4-in., 2 M.	..	13·5 t	165	121
2nd cl. cr.	Irene † . shd.	4400	308	46	21	8000	Stettin	1887	1888	220,000	3	..	4 5·9-in., 8 4·1-in., 6 1·9-in., 1 l., 8 M.	4	19·8 t	540	365
to. g. b.	Jagd	1250	275½	31½	13¾	4000	Bremen	1888	1889	..	2	..	4 3·4-in., 2 M.	3	20·0	230	141
g. b.	Jaguar . shd.	895	203½	29¾	10¾	1300 T	Danzig (Schichau)	1898	1899	90,000	..	..	8 3·4-in., 6 1·4-in., 2 M.	..	13·5 t	165	121
3rd cl. cr.	K. . shd.	3000	361	39½	15	5000 W.T.	Bremen	Bldg.	..	254,500	2	..	10 4·1-in., 12 1·4-in., 4 M., 2 l.	2 (sub.)	22·0	800	..
1st cl. cr.	Kaiserin Augusta † shd.	6331	387	52½	23	14,000	Kiel (Germania)	1892	1896	..	3½	..	12 5·9-in., 8 3·4-in., 2 l., 8 M.	5	21·0	850	436
3rd cl. cr.	L. . shd.	3000	361	39½	15	5000 W.T.	Stettin	Bldg.	..	254,500	2	..	10 4·1-in., 12 1·4-in., 4 M., 2 l.	2 (sub.)	22·0	800	249
g. b.	Luchs	977	206¾	30¼	10¾	1300 T	Danzig	1899	1900	91,000	..	..	8 3·4-in., 6 1·4-in., 2 M.	..	13·5 t	240	121
3rd cl. cr.	M.* . shd.	3000	361	39½	15	5000 W.T.	..	Pro.	..	254,500	..	..	10 4-in., 12 1·4-in., 4 M., 2 l.	2 (sub.)	22·0	800	..
3rd cl. cr.	Medusa . shd.	2665	328	38½	16	8000 T.S.	Bremen (Weser)	1900	1901	247,000	2	..	10 4·1-in., 12 1·4-in., 4 M., 2 l.	2 (sub.)	22·0	560	249
" "	Merkur (ex Arcona) shd.	2373	236½	42½	18¼	2400	Danzig	1885	1886	109,875	..	..	10 5·9-in., 4 4·1-in., 10 M., 1 l.	1	14·0	300	268
" "	Merkur (Ersatz)*	3000	361	39½	15	5000 W.T.	..	Pro.	..	254,500	..	..	10 4-in., 12 1·4-in., 4 M., 2 l.	2 (sub.)	22·0	800	..
d. v.	Meteor	946	262½	29½	11½	4500	Gaarden	1890	1900	..	2	..	2 3·4-in., 2 M.	3	21·0	120	90
3rd cl. cr.	Niobe . shd.	2665	328	38½	15	8000 T.	Bremen (Weser)	1899	1901	217,500	2	..	10 4·1-in., 12 1·4-in., 4 M., 2 l.	2 (1sub.)	20·0	560	250
3rd cl. cr.	Nymphe . shd.	2665	328	38½	15	8000 T.S.	Kiel (Germania)	1899	1901	217,500							
cr.	Olga (training)	2100	226½	42½	18¾	2100	Stettin	1880	1881	113,812	..	..	8 5·9-in., 2 3·4-in., 1 l., 6 M.	..	14·0	320	267
g. b.	Panther	977	206¾	30¼	10¾	1300 T.S.	Danzig	1901	1902	91,000	..	..	8 3·4-in., 6 1·4-in., 2 M.	..	13·5 t	240	121
cr.	Pelikan (mining ship)	2360	259	38	14½	3000	Kiel	1890	1891	..	..	..	4 3·4-in., 4 M.	..	15·4 t	370	183

* Estimates of 1903. It is stated that the Ersatz Merkur will have turbine engines. The gun-vessel B, 977 tons, is to be built at the Vulcan yard, Stettin, to cost £96,000.
† To be partially reconstructed. £25,000 voted 1903.

GERMANY.—Cruising Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.			kts.	tons.	
3rd cl. *cr*	**Pfeil**	1382	246	32¾	13½	2700	Wilhelmshaven	1882	1883	73,605	..	..	4 *3·4-in.*, 4 M.	1	16·0	180	135
2nd cl. *cr.*	**Prinzess Wilhelm** shd.	4400	339½	46	21	8000	Gaarden	1887	1888	220,000	3	..	4 *5·9-in.*, 8 *4·1-in.*, 6 *1·9-in.*, 1 l., 8 M.	4	18·7 *t*	540	365
g. v.	**Schwalbe**	1120	203	30½	12¼	1500	Wilhelmshaven	1887	1887	..	3	..	8 *4·1-in.*, 7 M.	..	13·5 *t*	264	117
3rd cl. *cr.*	**Seeadler**	1640	246	33½	15	2800	Hamburg	1892	1892	..	3	..	8 *4·1-in.*, 7 M.	2	16·0	300	165
" "	**Sophie** (training)	2100	226¼	42½	18¼	2100	Danzig	1892	1882	117,155	..	..	8 *5·9-in.*, 2 *3·4-in.*, 1 l., 6 M.	..	14·0	320	267
g. v.	**Sperber**	1120	236	29¾	12½	1500	Wilhelmshaven	1888	1889	..	3	..	8 *4·1-in.*, 6 M.	..	13·5 *t*	264	117
3rd cl. *cr.*	**Thetis** shd.	2665	344½	38½	16	8000 T.S.	Danzig	1900	1901	247,000	2	..	10 *4·1-in.*, 12 *1·4-in.*, 4 M., 2 l.	2 (sub.)	21·8 *t*	560	249
g. b.	**Tiger**	894	203½	29¾	10	1300 T.S.	Danzig	1899	1900	..	..	..	8 *3·4-in.*, 6 *1·4-in.*, 2 M.	..	13·5 *t*	240	121
" "	**Undine** shd.	2665	328	38½	16	8000 T.S.	Kiel (Howaldt)	1902	..	254,500	2	..	10 *4·1-in.*, 12 *1·4-in.*, 4 M., 2 l.	2 (sub.)	21·0	700	249
2nd cl. *cr.*	**Victoria Luise**	5650	344½	57	21¾	10,000 Dürr.	Bremen	1897	1898	..	4 H.S.	4 H.S.	2 *8·2-in.*, 8 *6-in.*, 10 *3·4-in.*, 10 *1·4-in.*, 4 M.	3 (sub.)	19·5 *t*	825	465
" "	**Vineta** shd.	5900	345½	57¾	21¾	10,000 Dürr.	Danzig	1897	1899	..	4 H.S.	4 H.S.	2 *8·2-in.*, 8 *6-in.*, 10 *3·4-in.*, 10 *1·4-in.*, 4 M.	3 (sub.)	19·5 *t*	825	465
l. v.	**Zieten**	1010	226½	28	13¾	2350	Blackwall	1876	1876	81,755	..	..	6 *1·9-in.*, 6 M.	..	15·9 *t*	140	115
3rd cl. *cr.*	**Zieten (Ersatz)** shd.	3000	361	39½	15	5000	Danzig	Bldg.	..	254,500	2	..	10 *4·1-in.*, 12 *1·4-in.*, 4 M., 2 l.	2 (sub.)	22·0	800	..

The Charlotte, Marie, Mars, Grille, Hay, Ulan, Brummer, Nixe, Olga, Rhein, Moltke, Stein, and Stosch are used as schoolships. The Blücher (2856 tons), built at Kiel in 1877, is the torpedo training ship, and the Carola (2169 tons), built at Stettin in 1880, the gunnery ship.

The Imperial Yacht Hohenzollern, 4187 tons, 9460 I.H.P., 22 knots, carries 8 1·9-in. Q.F., but provision is made for mounting 3 4·1-in., 12 1·9-in. Q.F. and 4 M.

The station vessel for Constantinople is named the Loreley. The Vorwärts and Schamien, gunboats, are converted trading vessels for river service in China.

A river gunboat for China is in hand at Danzig (Schichau).

Merchant Cruisers (Auxiliaries to the German Navy).

To what Company belonging.	Name of Ship.	Register Tonnage.	Length.		Beam.		Draught of Water.		Indicated H.P.	Ocean Speed.	When Built.	Armament of each Ship.
		tons.	ft.	in.	ft.	in.	ft.	in.		knots.		
Hamburg-American S.S. Co.	Fürst Bismarck . .	8430	504	4	57	6	22	3	16,410	19½	1891	The armament is of 6-in. and smaller quick-firers.
	Auguste Victoria . .	8479	522	2	56	4	23	0	12,280	18½	1889	
	Deutschland . . .	16,502	662	7	67	0	29	3	37,000	23½	1900	
	Columbia	7241	461	6	55	8	21	10	13,680	18½	1889	
	Hamburg	10,600	499	3	60	1	..		1016(*a*)	16	1889	
	Kiautchau	10,911	522	5	60	1	..		1016(*a*)	16	1900	
North German Lloyd	Lahn	5100	449	6	49	0	22	0	9500	18	1887	
	Kronprinz Wilhelm .	14,800	640	0	66	0	26	3	30,000	23½	1901	
	Kaiser Wilhelm der Grosse	14,349	625	0	66	0	27	0	28,000	23	1897	
	Kaiser Wilhelm II . .	19,500	678	0	72	0	..		44,000	24	1902	
	Kaiserin Maria Theresia	8286	526	0	52	0	22	2	17,000	19½	1900	
	Aller	5217	436	6	48	0	..		1300(*a*)	16	1885	
	Trave	5262	436	6	48	0	..		1300(*a*)	16	1886	

(*a*) Nominal horse-power.

Many other vessels of the same companies are on the list, steaming at less than 16 knots.

GREECE.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.						in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	Hydra . . .	4885	334½	51¾	23¼	7000	St. Nazaire La Seyne .	1889 1900	1891	..	11¾–4	2½	3	..	13½	..					
b.	Psara . . .	4885	334½	51¾	23¼	7000	Havre . . La Seyne .	1890 1897	1892	..	11¾–4	2½	3	..	13½	..	3 *10·6-in.* Canet, 5 *5·9-in.*, 1 *3·9-in.*, 8 *2·5-in.* 4 *1·8-in.*, 12 *1·4-in.*	3	17·0	600	400
b.	Spetsai . . .	4885	334½	51¾	23¼	7000	Havre . . La Seyne .	1889 1900	1891	..	11¾–4	2½	3	..	13½	..					

GREECE.—Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.						in.	in.			knots.	tons.	
g.v.	Acheloos	420	130	24½	11½	400	Blackwall .	1884	1885	..	..	..	2 *3·7-in.* (K.), 3 M.. .	..	10·0	50	..
g.v.	Alphios	420	130	24½	11½	400	Blackwall .	1884	1885	..	..	..	2 *3·7-in.* (K.), 3 M.. .	..	10·0	50	..
g.v.	Eurotas	420	130	24½	11½	400	Dumbarton .	1884	1885	..	..	..	2 *3·7-in.* (K.), 3 M.. .	..	10·0	50	..
corv.	Sfaktirea . . .	1000	216½	29¼	18	2400	England . .	1885	1886	..	..	..	2 *3·9-in.* (K.), 2 M.. .	..	14·5	100	..

Torpedo depôt-ship.—Kanaris, 1100 tons, 500 I.H.P., 2 3·9-in. (Krupp) guns, 2 Whitehead torpedo-launching guns on broadside, 2 under-water torpedo tubes ahead; 14 knots speed. Gunboats, Ambrakia and Aktion, of 440 tons displacement, 380 horse-power, 10 knots speed, fitted with 1 10·2-in. Krupp gun and 2 machine guns; launched 1885; 4 gunboats, A. B. Γ. Δ. (52 tons, 1 4·7-in. Krupp), launched 1881; and 3 mining vessels (300 tons), launched 1881.
It is stated that three cruisers are to be built by Italian firms.

ITALY.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Second-ary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		Metric tons.	ft.	ft.	ft.					£	in.	ins.	ins.	ins.	ins.	ins.			knots.	tons.	
t.	Affondatore . .	4062	290	40	20	3240	Millwall .	1865	1868	197,600	5 iron.	2	..	..	5 iron.	..	2 *28-ton* (A.), 6 *4·7-in.*, 2 *2·9-in.*, 4 *2·2-in*, 4 *1·4-in.*, 2 M.	2	12·0	460	303
"	Ammiraglio di St. Bon	9800	344½	69¼	24¾	13,500	Venice .	1897	1901	..	9¾–4 H.S.	3–1½	6 H.S.	6 H.S.	9¾ H.S.	6 H.S.	4 *10-in.*, 8 *6-in.*, 8 *4·7-in.*, 2 *2·9-in.*, 8 *2·2-in.*, 12 *1·4-in.*, 2 M.	4	18·3 t	600	548
b.	Andrea Doria . .	11,000	328¼	65¼	27¼	10,500	Spezia .	1885	1889	765,500	18 comp.	3	18 comp.	14 comp.	18 comp.	..	4 *105-ton* (A.), 2 *6-in.*, 4 *4·7-in.*, 2 *2·9-in.*, 10 *2·2-in.*, 17 *1·4-in.*, 2 M.	5 (2sub.)	16·1 t	850	526
b.	Benedetto Brin . .	13,427	426½	78¼	27¼	19,000 B.	Castellamare .	1901	..	..	6–2 H.S.	3	6 H.S.	8 H.S.	10 H.S.	6 H.S.	4 *12-in.*, 4 *8-in.*, 12 *6-in.*, 16 *3-in.*, 8 *1·8-in.*, 4 M.	4 (sub.)	19·5 t	1000 / 2000	719
a.c.	Carlo Alberto . .	6500	325	59	23	13,220 t	Spezia .	1896	1893	..	6–4½ H.S.	1½	6 H.S.	..	6 H.S.	4½ shields	12 *6-in.*, 6 *4·7-in.*, 2 *2·9-in.*, 10 *2·2-in.*, 10 *1·4-in.*, 2 M.	4	19·2 t	1000	500
t.	Dandolo * . . .	11,202	341	64¾	26½	8045	Spezia .	1878 1898	1881	872,640	21½	2	17	16	10 H.S.	2 screens	4 *10-in.* (A.), 7 *6-in.*, 5 *4·7-in.*, 2 *2·9-in.*, 10 *2·2-in.*, 14 *1·4-in.*, 2 M.	4	15·6 t	732	506
t.	Duilio . . .	11,138	341	64¾	26½	7710	Castellamare .	1876	1880	850,400	21½	2	17	16	18	..	4 *100-ton* M.L.R. (A.), 3 *4·7-in.*, 2 *2·9-in.*, 8 *2·2-in.*, 22 *1·4-in.*, 2 M.	3	15·0	1000	487
t.	Emanuele Filiberto .	9800	344½	69¼	24¾	13,500	Castellamare .	1897	1902	..	9¾–4 H.S.	3–1	6 H.S.	6 H.S.	9¾ H.S.	6 H.S.	4 *10-in.*, 8 *6-in.*, 8 *4·7-in.*, 2 *2·9-in.*, 8 *2·2-in.*, 12 *1·4-in.*, 2 M.	4	18·3 t	600	536
b.	Francesco Morosini .	11,000	328¼	65¼	27¼	9560	Venice .	1885	1889	770,680	18 comp.	3	18 comp.	14 comp.	18 comp.	..	4 *105-ton* (A.), 2 *6-in.*, 4 *4·7-in.*, 2 *2·9-in.*, 10 *2·2-in.*, 17 *1·4-in.*, 2 M.	5 (2sub.)	17·0	850	509
a.c.	Francesco Ferruccio	7350	344	59¾	23¼	13,500 Nic.	Venice .	1902	..	..	6–3 H.S.	1½	6 H.S.	5 H.S.	6 H.S.	6 H.S.	1 *10-in.*, 2 *8-in.*, 14 *6-in.*, 10 *2·9-in.*, 6 *1·8-in.*, 2 M.	4 (sub.)	20·0	655	540
a.c.	Giuseppe Garibaldi					14,713 t Nic.	Sestri-Ponente (Ansaldo)	1899	1901											1200	
b.	Italia † . . .	14,387	400½	74	31¼	11,986 t	Castellamare .	1880	1884	1,167,680	16 funnel op'nings	3	..	..	19 comp.	..	4 *100-ton* (A.), 8 *6-in.*, 4 *4·7-in.*, 12 *2·2-in.*, 24 *1·4-in.*, 2 M.	4	18·0 t	1200	748

* New armament given. The reconstruction of the Duilio is not likely to be proceeded with.

† To receive new boilers.

ITALY.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour: Belt.	Armour: Deck.	Armour: Side above Belt.	Armour: Bulkhead.	Armour: Gun Position: Heavy Guns.	Armour: Gun Position: Secondary.	Armament: Guns.	Armament: Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			kt.	tons.	
b.	Lepanto	14,400	400½	74	31¼	15,800 *t*	Leghorn (Orlando)	1883	1887	1,150,880	16 funnel op'nings	3	..	..	19 *comp.*	..	4 *100-ton* (A.), 8 *6-in.*, 4 *4·7-in.*, 12 *2·2-in.*, 34 *1·4-in.*, 2 M.	4	18·38 *t*	1650	748
a.c.	Marco Polo	4583	327	48¾	19½	10,543 *t*	Castellamare	1890	1895	314,400	4	1	4	4	4	..	6 *5·9-in.*, 10 *4·7-in.*, 2 *2·9-in.*, 9 *2·2-in.*, 4 *1·4-in.*, 2 M.	5 (1sub.)	19·0 *t*	600	394
b.	Napoli * / Regina Elena	12,624	435½	73½	27½	20,000 B.	Castellamare / Spezia	Pro. / Bldg.	.. / ..	1,000,000	9¾ H.S.	4	6 H.S.	8 H.S.	8 H.S.	6 H.S.	2 *12-in.*, 12 *8-in.*, 12 *3-in.*, 12 *1·8-in.*	2 (sub.)	22·0	1000 / 2000	..
b.	Regina Margherita	13,427	426½	78¼	27¼	19,000 Nic.	Spezia	1901	..	..	6 H.S.	3	6 H.S.	8 H.S.	8 H.S.	6 H.S.	4 *12-in.* 4 *8-in.*, 12 *6-in.*, 16 *3-in.*, 8 *1·8-in.*, 4 M.	4 (sub.)	19·5	1000 / 2000	719
b.	Re Umberto	13,825	400	76¾	28½	19,500	Castellamare	1888	1893	1,058,500	4	3	4	2¾	18	..	4 *67-ton* (A.), 8 *6-in.*, 16 *4·7-in.*, 2 *9-in.*, 15 *2·2-in.*, 14 *1·4-in.*, 2 M.	8	19·0	1200	785
b.	Roma *	12,624	435½	73½	27½	20,000 B.	Spezia	Pro.	..	1,000,000	9¾ H.S.	4	6 H.S.	8 H.S.	8 H.S.	6 H.S.	2 *12-in.*, 12 *8-in.*, 12 *3-in.*, 12 *1·8-in.*	2 (5sub.)	22·0	1000 / 2000	..
b.	Ruggiero di Lauria	11,000	328¼	65¼	27¼	10,600	Castellamare	1884	1887	777,560	18 *comp.*	3	18 *comp.*	14 *comp.*	18 *comp.*	..	4 *105-ton* (A.), 2 *6-in.*, 4 *4·7-in.*, 2 *2·9-in.*, 10 *2·2-in.*, 17 *1·4-in.*, 2 M.	5 (2sub.)	17·0	910	509
b.	Sardegna	13,860	411	76¾	28½	19,650 *t*	Spezia	1890	1895	1,057,440	4	3	4	2¾	14¼ *comp.*	..	4 *67-ton* (A.), 8 *5·9-in.*, 16 *4·7-in.*, 2 *2·9-in.*, 20 *2·2-in.*, 10 *1·4-in.*, 2 M.	5	20·1 *t*	1200	785
"	Sicilia	13,375	400	76¾	28½	19,500	Venice	1891	1895	1,050,000	4	3	4	2¾	18 *comp.*	..	4 *67-ton* (A.), 8 *5·9-in.*, 16 *4·7-in.*, 2 2 *9-in.*, 20 *2·2-in.*, 10 *1·4-in.*, 2 M.	5	19·2 *t*	1200	785
a.c.	Varese	7400	314	59¾	23⅓	13,500 B.	Leghorn (Orlando)	1899	1900	..	6–4½ H.S.	1½	6 H.S.	5 H.S.	6 H.S.	6 H.S.	1 *10-in.*, 2 *8-in.*, 14 6-in., 10 *2·9-in.*, 6 *1·8-in.*, 2 M.	4	20·0	650 / 1200	500
b.	Vittorio Emanuele III.	12,624	435½	73½	27½	20,000 B.	Castellamare	Bldg.	..	1,000,000	9¾–4 H.S.	4	6 H.S.	8 H.S.	8 H.S.	6 H.S.	2 *12-in.*, 12 *8-in.*, 12 *3-in.*, 12 *1·8-in.*	2 (sub.)	22·0	1000 / 2000	..
a.c.	Vettor Pisani	6500	325	59	23	13,000	Castellamare	1895	1897	..	6 H.S.	1½	6 H.S.	..	6 H.S.	4½ shields	12 *6-in.*, 6 *4·7-in.*, 2 *2·9-in.*, 10 *2·2-in.*, 10 *1·4-in.*, 2 M.	5	20·0	600	504

* Estimates 1903–4. Names doubtful.

ITALY.—Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Comp'et'on.	Cost.	Armour. Deck.	Armour. Gun Position.*	Armaments. Guns.	Armaments. Torpedo Tubes.	Speed.	Coal.	Comp'ement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
to.cr	Agordat	1313	287½	30½	11	8000	Castellamare	1899	1900	..	1	..	4 4·7-*in.*, 8 2·2-*in.*, 2 1·4-*in.*	2	22·0	160	158
3rd cl. *cr.*	Amerigo Vespucci (training)	2795	256	42½	17	3340	Venice	1882	1884	176,300	¾	..	4 4·7-*in.*, 1 3-*in.*, 4 2·2-*in.*, 4 1·4-*in.*, 4 M.	2	14·0	500	265
d.v.	Archimede	784	230	26¼	10	1401	Venice	1887	1888	60,120	..	..	4 4·7-*in.*, 2 2·2-*in.*, 2 1·4-*in.*	2	16·0	210	109
to g.b.	Aretusa	846	230	26¾	11¾	4420	Leghorn (Orlando)	1891	1892	72,920	1	..	1 4·7-*in.*, 6 2·2-*in.*, 3 1·4-*in.*	6	20·7 *t*	120	111
3rd cl. *cr.*	Calabria	2442	249¼	42	16¾	4094 *t*	Spezia	1894	1897	183,120	2	..	4 5·9-*in.*, 6 4·7-*in.*, 1 2·9-*in.*, 8 2·2-*in.*, 8 1·4-*in.*, 2 M.	2	16·4 *t*	500	257
to.g.b.	Calatafimi	840	229½	27	10¼	4136	Castellamare	1893	1894	72,920	1	..	1 4·7-*in.*, 6 2·2-*in.*, 3 1·4-*in.*	6	20·0	120	111
"	Caprera	853	230	27¼	10¼	4189	Leghorn (Orlando)	1894	1895	72,920	1	..	2 4·7-*in.*, 4 2·2-*in.*, 2 1·4-*in.*	5	21·0	120	111
to.cr.	Coatit	1313	287½	30½	11	8160	Castellamare	1899	1902	..	1	..	4 4·7-*in.*, 8 2·2-*in.*, 2 1·4-*in.*	2	21·1 *t*	160	158
3rd cl. *cr.*	Cristoforo Colombo	2757	249	36	17½	2321	Venice	1892 Rebuilt	1893	157,240	..	..	6 4·7-*in.*, 2 2·2-*in.*, 4 1·4-*in.*	..	16·0	445	238
g.v	Curtatone	1292	177¼	32¾	13½	1100	Venice	1887	1888	58,440	..	..	4 2·2-*in.*, 2 1·4-*in.*, 2 M.	..	12·0	197	131
3rd cl. *cr.*	Dogali	2088	250	37	14½	7600	Elswick	1887	1889	156,040	2	4½	6 6-*in.* (A.), 1 2·9-*in.*, 9 2·2-*in.*, 2 1·4-*in.*, 2 M.	4	19·66 *t*	480	257
"	Elba . . shd.	2730	272½	40¾	16½	7471 *t*	Castellamare	1893	1895	200,000	2	4½	4 5·9-*in.*, 6 4·7-*in.*, 1 2·9-*in.*, 8 2·2-*in.*, 8 1·4-*in.*, 2 M.	2	17·9 *t*	500	272
2nd cl. *cr.*	Etna	3530	282¼	42½	19	6169	Castellamare	1885	1887	226,720	1½	5	2 9·8-*in.* (A.), 6 5·9-*in.*, 1 2·9-*in.*, 5 2·2-*in.*, 8 1·4-*in.*, 2 M.	4	17·8	630	315

* Shields.

ITALY.—Cruising Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.*	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
to.g.b.	**Euridice**	840	229½	27	10¼	4162	Castellamare	1891	1892	72,920	1	..	1 *4·7-in.*, 6 *2·2-in.*, 3 *1·4-in.*	6	19·8 *t*	120	111
3rd cl. *cr.*	**Etruria**	2280	262½	39½	16½	7585 *t*	Leghorn (Orlando)	1891	1893	183,120	2	4½	4 *5·9-in.*, 6 *4·7-in.*, 1 *2·9-in.*, 8 *2·2-in.*, 10 *1·4-in.*, 2 M.	2	19·81 *t*	400	257
2nd cl. *cr.*	**Fieramosca**	3600	290	43½	19¼	7700	Leghorn (Orlando)	1888	1890	240,120	1½	5	2 *9·8-in.*, 6 *6-in.*, 1 *2·9-in.*, 5 *2·2-in.*, 8 *1·4-in.*, 2 M.	4	17·5 *t*	450	315
cr.	**Flavio Gioja** (training)	3064	256	42½	17	4150	Castellamare	1881	1883	193,920	1½	..	4 *4·7-in.*, 1 *8-in.*, 4 *2·2-in.*, 4 *1·4-in.*, 4 M.	2	15·0	500	265
d.v.	**Galilei**	900	230	26¼	8¼	1384	Venice	1887	1888	56,720	..	..	4 *4·7-in.*, 2 *2·2-in.* 2 *1·4-in.*	2	15·0	210	109
3rd cl. *cr.*	**Giovanni Bausan**	3068	275½	42½	18¼	6500	Elswick	1883	1885	179,120	1½	5	2 *9·8-in.* (A.), 6 *5·9-in.*, 1 *2·9-in.*, 4 *2·2-in.*, 8 *1·4-in.*, 2 M.	3 (1sub.)	17·5 *t*	600	295
to.g.b.	**Goito**	812	230	25½	11¾	2620	Castellamare	1887	1888	70,680	1	..	4 *2·2-in.*, 5 *1·4-in.*	5	19·0	130	111
g.v.	**Governolo**	1255	185	33¾	13¾	1100	Venice	1894	1896	58,440	..	..	4 *4·7-in.*, 4 *2·2-in.*, 2 *1·4-in.*, 2 M.	..	13·0	200	131
to.g.b.	**Iride**	840	229½	27	10¼	4242	Castellamare	1891	1892	72,920	1	..	1 *4·7-in.*, 6 *2·2-in.*, 3 *1·4-in.*	6	19·6 *t*	120	111
3rd cl. *cr.*	**Liguria**	2280	262½	39¼	16¾	7677 *t*	Sestri (Ansaldo)	1893	1894	183,120	2	4½	4 *5·9-in.*, 6 *4·7-in.*, 1 *2·9-in.*, 8 *2·2-in.*, 10 *1·4-in.*, 2 M.	2	19·6 *t*	430	257
" "	**Lombardia**	2380	262½	39½	16½	6843 *t*	Castellamare	1890	1892	183,120	2	4½	4 *5·9-in.*, 6 *4·7-in.*, 1 *2·9-in.*, 8 *2·2-in.*, 8 *1·4-in.*, 2 M.	2	17·0 *t*	430	257
to.g.b.	**Minerva**	846	246	27½	11¾	4800 W.T.	Sestri (Ansaldo)	1892	1893	72,720	1	..	1 *4·7-in.*, 6 *2·2-in.*, 3 *1·4-in.*	5	21·0	120	111

to.g.b.	**Montebello**	814	230	25½	11¾	2776	Spezia	1888	1890	74,120	..	1	6 *2·2-in.*, 2 *1·4-in.*	4	18·0	100	111
"	**Partenope**	840	246	27½	11¾	4200	Castellamare	1890	1890	71,000	..	1	1 *4·7-in.*, 6 *2·2-in.*, 3 *1·4-in.*	5	19·0	100	111
3rd cl. *cr.*	**Piemonte**	2500	300	38	15	12,000	Elswick	1888	1890	220,000	3	3	6 *6·6-in.*, 6 *4·7-in.*, 10 *2·2-in.*, 6 *1·4-in.*, 4 M.	3	21·0	560	325
3rd cl. *cr.*	**Puglia**	2550	269	41	16¾	7000	Taranto	1898	1900	200,000	4½	1	4 *5·9-in.*, 6 *4·7-in.*, 1 *2·9-in.*, 8 *2·2-in.*, 8 *1·4-in.*, 2 M.	2	20·0	650	257
d.v.	**Rapido**	1568	262½	30½	12½	1450	Leghorn (Orlando)	1876	1877	77,400	..	..	5 *2·2-in.*, 2 M.	1	13·4 *t*	300	135
to.g.b.	**Saetta**	400	187	19¾	6½	2400	Castellamare	1887	1888	38,880	..	..	2 *2·2-in.*, 4 *1·4-in.*	3	20·0	90	70
g.v.	**Scilla**	1076	177¼	28½	12½	826	Castellamare	1874	1875	65,520	..	..	4 *2·2-in.*, 2 M.	..	10·0	140	111
d.v.	**Staffetta**	1806	252½	30¾	13¼	1800	Sampierdarena (Ansaldo)	1876	1877	82,600	..	..	4 *4·7-in.*, 2 *1·4-in.*	1	13·5 *t*	300	135
2nd cl. *cr.*	**Stromboli**	3475	282¼	42½	19	6298	Venice	1886	1888	220,080	5	1·5	2 *9·8-in.* (A.), 6 *5·9-in.*, 1 *2·9-in.*, 5 *2·2-in.*, 8 *1·4-in.*, 2 M.	4	17·0	600	315
to.g.b.	**Tripoli**	848	230	25¾	11¾	2543	Castellamare	1886	1887	72,080	..	1	7 *2·2-in.*	4	18·0	130	107
3rd cl. *cr.*	**Umbria**	2280	262½	39½	16½	7104 *t*	Leghorn (Orlando)	1891	1893	183,120	4½	2	4 *5·9-in.*, 6 *4·7-in.*, 8 *2·2-in.*, 10 *1·4-in.*, 1 1, 2 M.	2	18·83 *t*	430	257
to.g.b.	**Urania**	846	230	27	11¼	4397	Sestri (Odero)	1891	1892	72,920	..	1	1 *4·7-in.*, 6 *2·2-in.*, 3 *1·4-in.*	6	20·0	120	111
2nd cl. *cr.*	**Vesuvio**	3427	282¼	42½	19	6820	Leghorn (Orlando)	1886	1888	218,320	5	1·5	2 *9·8-in.*, 6 *5·9-in.*, 1 *2·9-in.*, 5 *2·2-in.*, 8 *1·4-in.*, 2 M.	4	17·0	600	315
g.v.	**Volturno**	1174	177¼	32¾	14¼	1100	Venice	1887	1888	58,960	..	..	4 *4·7-in.*, 4 *2·2-in.*, 2 *1·4-in.*, 2 M.	..	13·0	206	131

Subsidised auxiliary cruisers and despatch vessels.—Nord America, Vittoria, Duca de Galliera, and Duchessa di Genova (La Veloce S.S. Co.), Regina Margherita, Elettrico, Candia, Malta, Perseo and Orione (Navigazione Generale). The armament of these vessels is 2 2·2-in. Q.F., and 4 1·4-in. M. Two coal transports of 8500 tons, carrying 6000 tons of coal, are proposed to be built by Orlando, at Leghorn.

* Shields.

JAPAN.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.*	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.						in.	in.	in	in.	in.	in.			knots.	tons.	
t.	Asahi	15,200	400	75¼	27¼	15,000 B.	Clydebank	1899	1900	..	9–4 H.S.	4–2½	6 H.S.	12 H.S.	14 H.S.	6 H.S.	4 12-in., 14 6-in., 20 12-pr., 8 3-pr., 4 2½-pr.	4 (sub.)	18	1400	750
a.c.	Asama	9750	408	67	24¼†	19,000 t	Elswick	1898	1899	..	7–3½ H.S.	2	5 H.S.	..	6	6 H.S.	4 8-in., 14 6-in. (A), 12 12-pr., 7 2½-pr.	5 (4 sub.)	22·3 t	600 / 1200	482
a.c.	Azuma	9136	445¾	59½	28	17,000 B.	St. Nazaire	1899	1901	..	7–3½ H.S.	3	5 H.S.	..	6 H.S.	6 H.S.	4 8-in., 12 6-in., 12 3-in., 12 1·8-in.	5 (4 sub.)	20·0	..	482
b.	Chin-Yen	7400	308½	59	20	6200	Stettin	1882	1884	..	14	3	12	..	12	..	4 12-in. (K.), 4 6-in., 8 1.. 8 M.	3	14	1000	250
a.c.	Chiyoda	2450	308	42½	14	5700 B.	Clydebank	1889	1890	..	4½	1–2	..	..	..	..	10 4·7-in., 14 3-pr., 3 M.	3	17·5	420	300
b.	Fuji	12,320	374	73	26½	14,000	Thames	1896	1897	..	18–6 H.S.	4–2½	4 H.S.	..	14 H.S.	6 H.S.	4 12-in, 10 6-in., 20 3-pr., 4 4½-pr.	5 (4 sub.)	19·2 18·5 t	1100	600
b.	Hatsuse	15,000	400	76½	27	16,300 B,	Elswick	1899	1900	..	9–4 H.N.S.	4–2½	6 H.N.S	12 H.N.S	14 H.N.S	6 H.N.S	4 12-in., 14 6-in., 20 12-pr. 8 3-pr., 4 2½-pr.	4 (sub.)	19·11 t	1100 / 1400	741
c.d.s.	Hei-Yen	2000	200	40	16	2400	Foo Chow	1890	1894	..	8	2	..	..	5	..	1 10·2-in. (K.), 2 5·9-in. 6 M.	4	11·0	350	250
a.c.	Idzumo	9750	400	68½	24¼†	17,300 B.	Elswick	1899	1901	..	7–3½ H.N.S.	2½	5 H.N.S	..	6 H.N.S.	6 H.N.S	4 8-in., 14 6-in., 12 12-pr. 8 2½-pr.	4 (sub.)	21·0 21·8 t	700 / 1600	672
a.c.	Iwate							1900	1901												
b.	Mikasa	15,200	400	76	27¼	15,000 B.	Barrow	1900	1902	..	9–4 H.N.S.	3	6 H.N.S.	12 H.N.S	14 H.N.S.	6 H.N.S.	4 12-in., 14 6-in., 20 12-pr., 8 3-pr., 4 2½-pr.	(4 sub.)	18·6 t	700 / 1520	935
b.	Shikishima	14,850	400	75½	27¼†	14,500 B.	Thames	1898	1899	..	9–4 H.N.S.	4–2½	6 H.N.S	12 H.N.S.	14	6 H.N.S	4 12-in., 14 6-in., 20 12-pr., 8 M.	5 (4 sub.)	18·5	700	741
a.c.	Tokiwa	9750	408	67	24¼†	20,000	Elswick	1898	1899	..	7–3½ H.S.	2	5 H.S.	..	6 H.S.	6 H.S.	4 8-in. 14 6-in. (A.), 12 12-pr., 7 2½-pr.	5 (4 sub.)	23·0	600 / 1200	500
a.c.	Yakumo	9850	407¾	64¼	23¾	16,000 B.	Stettin	1899	1901	..	7–3½ H.S.	2½	5 H.S.	..	6 H.S.	6 H.S.	4 8-in. (A.), 12 6-in., 12 12-pr. (A.), 7 2½-pr.	5 (4 sub.)	20·0	600 / 1100	500
b.	Yashima	12,320	374	73	26½	14,000	Elswick	1896	1897	..	18–6 H.S.	4–2½	4 H.S.	..	14 H.S.	6 H.S.	4 12-in., 10 6-in., 20 3-pr., 4 4½-pr.	5 (4 sub.)	19·2 18·5 t	1100	600

* All Q.F. guns and 12-in. for new ships are Armstrong.

† Mean draught.

The old ironclads Hi-yei and Kon-go, of 2200 tons displacement, are now used as training ships; armament, 3 6·6-in. Krupps and 6 5·9-in.
The old central battery ironclad *Fu-So* (3718 tons) built on the Thames, 1877, and sunk off Shikoku Island, 1897, was refloated and repaired.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
g.v.	Akagi	615	164	27	10	700	Yokosuka . .	1889	1891	..	..	..	1 8·2-in., 1 5·9-in., 2 1., 2 M.	..	13·0	..	113
cr.	Akashi	2700	306¾	40	16¼	8500	Yokosuka . .	1895	1897	327,000	2	4½ shield	2 6-in. (A.), 6 4·7-in., 12 3-pr., 4 M.	2	20·0	200	..
"	Akitsushima . .	3150	302	42½	18¼	8400	Yokosuka . .	1892	1893	..	3	..	4 6-in., 6 4·7-in., 10 3-pr.	4	19·0	..	330
g.v.	Atago	615	154	27	10½	700	Yokosuka . .	1887	1888	..	..	..	1 8·2-in., 1 4·7-in., 2 M. .	..	12·0	60	113
t.g.b.	Chihaya . . .	875	240	27½	13	5500	Yokosuka . .	1900	1901	..	..	..	2 4·7-in., 4 3-pr. . . .	5	21·0	200	..
cr.	Chitose . . .	4760	396	49	17½	Nor. 15,500	San Francisco .	1898	1899	205,200	4½	4½ shield	2 8-in., 10 4·7-in., 12 12-pr., 2 6-pr., 2 2½-pr.	5	22·5	350/1000	405
"	Hashidate . . .	4277	295	50¾	21¼	5400	Yokosuka . .	1891	1893	.. }	2	12	1 12·5-in. (Canet), 11 4·7-in., 5 6-pr. 11 3-pr., 6 M.	4	17·0	400	350
"	Itsukushima . .	4277	295	50¾	21½	5400	La Seyne . .	1891	1893	.. }							
g.v.	Iwaki	700	147	25	11	700	Yokosuka . .	1883	1884	..	..	..	1 5 9-in., 2 4·7-in. . .	..	10·0	600	115
"	Idzumi (ex Esmeralda)*	2800	270	40	18¼	6500	Elswick . .	1878 1892	1879	..	3	2¼ shield	2 6-in., 6 4·7-in., 7 6-pr., 2 M.	..	17.4	400	300
cr.	Kasagi	5416	393½	48¾	19	15,797	Philadelphia .	1897	1898	205,200	4½–1¾	4½ shield	2 8-in., 10 4·7-in., 12 12-pr., 6 1·8-in.	5	t 22·5	350/1000	405
t.c.	Katsuraki . . } Musashi . . }	1476	206¾	36	15	1600	Yokosuka . .	1885	1887	..	..	..	2 6-in. (K.), 5 4·7-in., 2 M. .	2	t 13·0	..	242
g.v.	Maya	615	154	27	10	700	Yokosuka . .	1886	1887	..	..	..	1 8·2-in., 1 4·7-in., 2 M.	..	13·0	60	113
cr.	Matsushima . .	4277	295	50¾	21¼	5400	La Seyne . .	1890	1892	..	2	12	1 12·5-in. (Canet), 11 4·7-in., 5 6-pr., 11 3-pr., 6 M.	4	17·5	400	350
"	Miyako . . .	1800	314¾	36	13¼	6130	Kure . .	1899	1901	..	..	..	2 4·7-in., 10 1·8-in. . .	2	t 20·0	..	..

* Reconstructed in Japan ; part new armament, as given, and new boilers; torpedo-tubes removed.

JAPAN.—Cruising Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons	
cr.	**Naniwa**	3650	300	46	18½	7235	Elswick	1885	1886	..	3	1½ shield	2 *10·2-in.* (A.), 6 *5·9-in.*, 2 *3-pr.*, 10 M.	4	18·72 *t*	800	350
cr.	**Niitaka**	3420	235½	44	16½	10,000 Nic.	Yokosuka	1902	..	..	2½	..	6 *6-in*, 10 *3-in.*, 4 *2½-pr.*	..	20·0	600	..
g.v.	**Oshima**	630	164	27	10	700	Yokosuka	1890	1891	..	..	..	4 *4·7-in.*, 8 l.	..	13·0	..	..
cr.	**Sai yen** (ex Tsi Yuen)	2300	263¼	33	15¾	2800	Stettin	1883	1895	..	3	9	2 *8·2-in.*, 1 *5·9-in.*, 4 l. 10 M.	4	14·5 *t*	230	200
cr.	**Suma**	2700	306¾	40	16¼	8500	Yokosuka	1896	1898	257,000	2	4½ shield	2 *6-in.*, 6 *4·7-in.*, 12 *3-pr.*, 4 M.	2	20·0	200	..
"	**Takao**	1774	230	33	13	2330	Yokosuka	1888	1889	..	..	..	4 *6-in.*, 1 *4¾-in.* do., 6 M.		15·0	300	255
"	**Takachiho**	3700	300	46	18½	7500	Elswick	1885	1886	..	3	1½ shield	2 *10·2-in.* (A.), 6 *5·9-in.*, 2 *3-pr.*, 10 M.	4	18·7 *t*	800	365
"	**Takasago**	4160	360	46½	17	15,500 B.	Elswick	1897	1898	..	4½	4½ shield	2 *8-in.*, 10 *4·7-in.*, 12 *12-pr.*, 6 *2½-pr.*	5	23·0	800 / 1000	..
to.g.b.	**Tatsuta**	875	240	27½	13	5500	Elswick	1894	1894	..	..	..	2 *4·7-in.*, 4 *3-pr.*	5	21·0	200	..
"	**Ten-riu**	1500	200	32	16½	1250	Japan	1882	1885	..	..	..	1 *6·6-in.* (K.), 6 *4·7-in.*, 2 l.	..	12·0	256	222
cr.	**Tsukushi** (*ex* Arturo Prat)	1350	210	32	15	2887	Elswick	1882	1893	..	..	..	2 *10-in.* (A.), 4 *4·7-in.*, 2 l., 4 M.	2	16·5 *t*	250	190
"	**Tsushima**	3420	235½	44	16½	10,000 Nic.	Kure	Bldg.	..	..	2½	..	6 *6-in.*, 10 *3-in.*, 4 *2½-pr.*	..	20·0	600	..
"	**Yayeyama**	1600	315	34½	15	6000 Nic.	Yokosuka	1889	1890	..	..	..	3 *4·7-in.*, 6 M.	2	20·0	..	200
"	**Yamato**	1476	206¾	36	15	1600	Yokosuka	1885	1886	..	..	..	2 *6·6-in.* (K.), 5 *4·7-in.*, 4 M.	2	13·0	..	242
"	**Yoshino**	4180	350	46½	17	15,000	Elswick	1892	1893	..	4½	4½ shield	4 *6-in.*, 8 *4·7-in.*, 23 *3-pr.*	5	23·0	1000	300

The gunboats Chen-Pei, Chen Pien, Chen Nan, Chen Hsi, Chen Chung and Chen Tung (440 tons) were captured from the Chinese.

A cruiser of 3000 tons and 21 knots, the Otowa, is in hand at Yokosuka, and a gunboat of 620 tons, the Uji, at Kure.

NETHERLANDS.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots	tons.	
c.d.s.t.	Bloedhond . .	1683	182¾	46¼	10½	680	Amsterdam .	1869	1871	..	5½	1	..	..	9½	..	1 11-in. (K.), 1 2·9-in., 2 3-pr., 2 M.	..	7·7	104	118
,,	Cerberus . . .	1584	185¾	44	9¾	534	Amsterdam .	1869	1870	..	5½	1	..	..	9½	..	1 11-in. (K.), 1 2·9-in., 2 3-pr., 2 M.	..	7·0	80	118
,,	De Ruyter . .	4950	316¾	51½	21¾	6000 Y.	Amsterdam .	1900	1901	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	..	2 9·4-in., 4 5·9-in., 4 2·9-in., 8 1·4 in.	3 2 sub.	16·0	680	320
,,	Draak . . .	2234	213½	49¼	12	807	Amsterdam .	1877	1878	..	8	1	..	..	11	..	2 11-in. (K.), 1 2·9-in., 2 3-pr., 2 M.	..	8·0	100	133
,,	Evertsen . . .	3400	282¾	47	16¾	4735	Flushing .	1894	1896	..	6–4 H.S.	2	..	..	9½ H.S.	3 H.S.	3 8·2-in., 2 5·9-in., 6 2·9-in., 8 1·4-in.	3	16·0	280	260
,,	Haai . . .	1580	195¼	44	9½	672	Rotterdam .	1871	1872	..	5½	1	..	..	9½	..	1 11-in. (K.), 1 2·9-in., 2 3-pr., 2 M.	..	8·0	76	118
c.d.s.t.	Heiligerlee . .	1543	187	44	9½	630	Birkenhead .	1868	1870	..	5½	1	..	..	9½	..	1 11-in. (K.), 1 2·9-in., 2 3-pr., 2 M.	..	9·0	120	118
,,	Hertog Hendrik .	4950	316¾	51½	21¾	6000 Y.	Amsterdam .	1901	1903	347,500	6 H.N.S.	2	..	..	10 H.N.S.	..	2 9·4-in., 4 5·9-in., 4 2·9-in., 8 1·4-in.	3	16·0	680	320
,,	Hyena . . .	1580	192¼	44	9½	654	Amsterdam .	1870	1871	..	5½	1	..	..	9½	..	1 11-in. (K.), 1 2·9-in., 2 3-pr., 2 M.	..	7·0	76	118
c.d.s.t.	Koningin Regentes Nos. 4 & 5 .	4950	316¾	51½	21¾	6000 Y.	Amsterdam	1900 Bldg.	1902	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	..	2 9·4-in., 4 5·9-in., 4 2·9-in., 8 1·4-in.	3 2 sub.	16·0	680	320
t. & b.	Koningin Wilhelmina der Nederlanden * (I) shd.	4600	327½	48¾	20	5900	Amsterdam .	1892	1894	..	..	3	..	..	11	..	1 11-in., 1 8·2-in., 2 6·6 in., 2 2·9-in., 4 2·9-in., 4 1·4-in., 6 1·4-in., 2 M.	4	16·5	448	274

* Has received new engines and boilers.

NETHERLANDS.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns	Armour. Gun Position. Second-ary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in	in.	in.			knots	tons.	
c.d s t	Kortenaer . .	3400	282¾	47	16¾	4658	Amsterdam .	1894	1896	..	6 H.S.	2	..	..	9½ H.S.	3 H.S.	3 *8·2-in.*, 2 *5·9-in.*, 6 *2 9 in.*, 8 *1 4-in.*	3	16·0	280	260
,,	Krokodil . .	1547	187	44	9¾	630	Birkenhead .	1868	1870	..	5½	1	..	..	9½	..	1 *11-in.* (*K.*), 1 *2·9-in.*, 2 *3-pr.*, 2 M.	..	9·0	120	118
,,	Luipaard . .	1610	194¾	44	9½	680	Rotterdam .	1876	1878	..	5½	1	..	..	9½	..	1 *11-in.* (*K.*), 1 *2 9-in.*, 2 *3-pr.*, 2 M.	..	9.0	120	118
c.d.s.t.	Matador . . .	2000	209½	47¼	10½	691	Rotterdam .	1878	1880	..	5½	..	..	..	11	..	2 *11-in.* (*K.*), 1 *2·9-in.*, 2 *3-pr.*, 2 M.	..	7·5	100	130
,,	Panter . . .	1580	159¼	44	9½	560	Amsterdam .	1870	1871	..	5½	..	..	..	9½	..	1 *11-in.* (*K.*), 1 *2·9-in.*, 2 *3-pr.*, 2 M.	..	7·0	76	118
,,	Piet-Hein . .	3400	282¾	47	16¾	4736 *t*	Rotterdam .	1891	1896	..	6 H.S.	2	..	..	9½ H.S.	3 H.S.	3 *8·2-in.*, 2 *5·9-in.*, 6 *2·9-in*, 8 *1·4-in.*	3	16·2 *t*	280	260
t. & b.	Reinier Claeszen .	2479	229½	44¼	15	350	Amsterdam .	1891	1892	..	4¾–2 *comp.*	3	..	..	11 *comp*	6 *comp. shield*	1 *8·2-in.* (*K.*), 1 *6·6-in.*, 1 *2·9-in.*, 4 *1 9-in.*, 3 *1·4-in.*	2	12·5 *t*	88	160
c.d s.t.	Schorpioen . .	2235	205	38	16½	2225	La Seyne .	1868	1870	..	6	1	..	..	11	..	1 *11-in.* (*K*), 2 *2 9-in.*, 5 *3-pr.*, 2 M.	..	13·0	200	160
,,	Stier . . .	2112	205	38	16¼	2250	Birkenhead .	1868	1870	..	11	1	..	..	8	..	1 *11-in.* (*K.*), 2 *2 9-in.*, 5 *3-pr.*, 2 M.	..	12·4 *t*	160	154
,,	Wesp . . .	1580	195¼	44	9½	740	Amsterdam .	1871	1872	..	5½	1	..	..	9½	..	1 *11-in.* (*K.*), 1 *2 9-in.*, 2 *3-pr.*, 2 M.	..	8·0	76	118

NETHERLANDS.—Cruising Ships.

((I) denotes vessels of the Dutch Indian Navy.)

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	inches.	inches.			knots.	tons.	
g. v. . .	Borneo (I) . . shd.	800	176½	31	13¼	1040	Glasgow .	1892	1893	..	..	..	6 4·1-in., 1 2·9-in., 2 1·4-in., 2 M.	..	13·0	124	106
" . .	Ceram (I) . . shd.	550	173¼	25½	10¼	800	Flushing .	1887	1888	..	..	..	3 4·7-in. (K.), 1 2·9-in., 2 1·4-in.	..	12·5 t	70	82
" . .	Condor (I) . . shd.	350	126	20	10	300	Amsterdam .	1885	1886	..	..	..	1 2·3-in., 2 2-in.	..	10·0	26	40
g. v. . .	Edi (I)	810	166	30¾	11¾	1100	Flushing .	1897	1898	..	..	..	3 4·7-in., 2 2·9-in., 4 1 4-in.	..	13·0	113	95
" . .	Flores (I) . . shd.	550	173¼	25½	11¼	650	Amsterdam .	1887	1888	..	..	..	3 4·7-in., 1 2·9-in., 2 1·4-in.	..	11·7	75	82
cr. . .	Friesland . . .	3900	294	48½	17¾	10,000 Y.	Rotterdam .	1896	1898	285,700	2	..	2 5·9-in., 6 4·7-in., 4 2 9-in., 8 1·4-in., 4 smaller.	4	19·8 t	400	306
cr. . .	Gelderland . . .	4033	310¾	48½	17¾	10,000 Y.	Feijenoord .	1898	1900	..	2¼	..	2 5·9-in., 6 4·7-in., 4 2·9-in., 4 1·4-in., 4 M.	4	20·0	850	312
cr. . .	Holland . . .	3900	294	48½	17¾	10,000 Y.	Amsterdam .	1896	1898	285,700	2	..	2 5·9-in., 6 4·7-in., 4 2·9-in., 8 1·4-in., 4 M.	4	19 6 t	400	306
g. v. . .	Java (I) . . shd.	1300	205¼	31¼	14	1050	Rotterdam .	1885	1887	..	..	..	1 5·9-in., 3 4·7-in., 1 2·9-in., 2 1·4-in.	..	12·5 t	160	114
cr. . .	Koningin Emma der Nederlanden shd.	3528	301	41	21½	2730	Amsterdam .	1879	1882	..	..	..	6 6·6-in. 6-ton, 8 4·7-in. (K.), 2 2·9-in., 8 3-pr., 8 M.	..	14·0	470	301
g. v. . .	Lombok (I) . . shd.	600	172	27¼	11	990	Amsterdam .	1891	1892	..	..	..	3 4·7-in., 1 2·9-in., 2 3 pr.	..	12·0	55	87
" . .	Mataram (I) . .	810	166	30¾	11¾	1100	Amsterdam .	1896	1897	..	..	..	3 4·7-in., 2 3-in., 2 1·4-in.	..	13·0	113	95
" . .	Nias (I) . . .	810	166	30¾	11¾	1227	Amsterdam (Huygens)	1895	1896	..	..	..	3 4·7-in., 2 2·9-in., 4 1·4-in.	..	13·0	120	95

NETHERLANDS.—Cruising Ships—*continued*.

((I) denotes vessels of the Dutch Indian Navy.)

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		metric tons.	ft.	ft.	ft.					£	inches.	inches.			knots.	tons.	
cr.	Noord-Brabant	4033	299	48½	17¾	10,000 Y.	Flushing	1899	1901	..	2¼	..	2 5·9-*in.*, 6 4·7-*in.*, 4 2·9-*in.*, 4 1·4-*in.*, 4 M.	4	20·0	850	312
cr.	Pelikaan (I) . shd.	400	131¼	24	8¾	485	Rotterdam	1891	1892	..	..	..	3 4·7-*in.*, 1 3-*in.*, 2 3-*pr.* do.	..	11·35 *t*	43	40
cr.	Serdang (I)	810	166	30¾	11¾	1100	Flushing	1897	1898	..	..	..	3 4·7-*in.*, 2 2·9-*in.*, 4 1·4-*in.*	..	13·0	113	95
sl.	Sommelsdijk . shd.	1013	178½	31	14	700	Amsterdam	1881	1882	..	..	..	1 5·9-*in.*, 3 4·7-*in.* (K.), 1 2·9-*in.*	..	10·0	150	88
cr.	Sumatra (I)	1720	229½	37	14	3750	Amsterdam	1890	1892	..	1½	..	1 8·2-*in.*, 1 5·9-*in.*, 2 4·7-*in.*, 1 2·9-*in.*, 4 3-*pr.*, 2 M.	..	17·0	225	183
g.v.	Sumbawa (I)	600	174½	26½	11¼	930	Flushing	1891	1892	..	..	..	3 4·7-*in.*, 1 2·9-*in.*, 2 3-*pr.*	..	12·5 *t*	60	87
cr.	Utrecht	4033	310¾	48½	17¾	10,000 Y.	Amsterdam	1898	1900	..	2¼	..	2 5·9-*in.*, 6 4·7-*in.*, 4 2·9-*in.*, 4 1·4-*in.*, 4 M.	4	20·0	850	312
cr.	Van Speyk . shd.	3728	302	41	23	2891	Amsterdam	1880	1881	..	..	..	6 6·6-*in.* 6-*ton*, 8 4·7-*in.* (K.), 2 2·9-*in.*, 6 3-*pr.* 2 M.	..	14·0	360	301
cr.	Zeeland	3900	294	48½	17¾	10,589 Y. *t*	Flushing	1897	1898	285,700	2	..	2 5·9-*in.* 6 4·7-*in.*, 4 2·9-*in.*, 8 1·4-*in.*, 4 M.	4	19·4 *t*	400	306
g.v.	Zwaluw (I) . shd.	340	126	20	10	240	Flushing	1882	1883	..	..	..	2 3-*in.*, 2 2-*in.*	..	10·0	26	40

Gun-vessels of the Indian Navy: Arend, Flamingo, Raaf, Reiger, Valk, Zeeduif, and Zwaan (400 tons), launched between 1880 and 1891; Glatik (417 tons), 1894; Argus and Cycloop (438 tons), 1893.

Sixteen Gunboats (*Staunch class*) of 268 tons, and of 100 to 171 H.P.; also *five small gunboats* of 210 tons, and 124 to 174 H.P., and *one steel gunboat* of 108 tons and 172 I.H.P. The new programme contemplates the building of three unarmoured monitors, 14 gunboats and three schooners.

Bellona (920 tons), gunnery training ship; Makasser (850 tons), surveying vessel.

NORWAY.—Armoured Ships.

Class.	NAME	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour: Belt.	Armour: Deck.	Armour: Side above Belt.	Armour: Bulkhead.	Armour: Gun Position: Heavy Guns.	Armour: Gun Position: Secondary.	Armament: Guns.	Armament: Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			in.	in.			knots.	tons.	
c.d. s.t.	Eidsvold New Ship	3847	290	$50\frac{1}{2}$	$16\frac{1}{2}$	4500 Y.	Elswick	1900 Bldg.	1901 ..	..	6 H.N.S.	2	..	..	6 H.N.S.	6 H.N.S.	2 *8·2-in.*, 6 *5·9-in.*, 8 *12-pr.*, 6 *3-pr.*	2 sub.	16·5 *t*	400 / 600	261
”	Norge	3847	290	$50\frac{1}{2}$	$16\frac{1}{2}$	4500 Y.	Elswick	1900	1901	..	6 H.S.	2	..	..	6 H.S.	6 H.S.	2 *8·2-in.*, 6 *5·9-in.*, 8 *12-pr.*, 6 *3-pr.*	2 sub.	16·5 *t*	250 / 400	248
”	Harald Haarfagre	3556	280	$48\frac{1}{2}$	$16\frac{1}{2}$	3700	Elswick	1896	1898	190,000	7 H.S.	2	..	..	8 H.S.	..	2 *8-in.*, 6 *4·7-in.*, 6 *$1\frac{1}{2}$-pr.*, 6 *$1\frac{1}{2}$-pr.*	2 sub.	17·2 *t*	200 / 500	248
”	Torkenskjold							1897	1899												

Also the old monitors Mjölner, Skorpionen, Thor and Thrudvang.

Cruising Ships.

Class.	NAME	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour: Deck.	Armour: Gun Position.	Armament: Guns.	Armament: Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
g.b.	Æger	393	$108\frac{1}{2}$	$29\frac{1}{2}$	8	450	Horten	1892	1893	..	$1\frac{1}{2}$	..	1 *8·2-in.*, 1 *2·7-in.* 2 *1·9-in.*	..	9·0	..	43
g.v.	Ellida	1000	187	$32\frac{3}{4}$	$14\frac{1}{4}$	900	Horten	1880	1881	..	..	..	5 *5·9-in. 4-ton* (K.), 1 *4·7-in.*, 1 l., 2 M.	1	12·0	97	128
”	Frithjof	1371	$216\frac{1}{2}$	$32\frac{3}{4}$	$13\frac{1}{4}$	300	Horten	1896	1898	..	..	..	2 *4·7-in.*, 4 *2·9-in.* 4 *1·4-in.*, 2 l.	3 1 sub.	15·0	120	156
”	Heimdal	630	$167\frac{1}{4}$	$26\frac{3}{4}$	$11\frac{3}{4}$	700	Christiania	1892	1893	..	..	..	4 *2·5-in.*	..	12·0	92	62
g.v.	Sleipner	580	$173\frac{3}{4}$	26	$9\frac{1}{2}$	800	Horten	1877	1878	..	..	..	1 *10·2-in. 22-ton* (K.), 1 *5·9-in. 4-ton* do., 1 M.	1	12·0	80	87
to.g.b.	Valkyrien	380	190	$24\frac{1}{4}$	$9\frac{1}{4}$	3300	Elbing	1896	1897	..	..	..	2 *2·7-in.* 1 M.	2	23·2 *t*	90	57
g.v.	Viking	1113	$203\frac{1}{2}$	$30\frac{1}{2}$	13	2000	Horten	1891	1892	..	$1\frac{1}{2}$	..	2 *5·9-in.* (A.), 4 *2·5-in.*, 4 *1·4-in.*, 2 M.	3	15·0	140	156

Eleven Gunboats, of 189 to 280 tons, and of 180 to 450 I.H.P., armed with one large gun and machine guns in each.
Sixteen smaller Gunboats, of 60 tons, 70 I.H.P., and $7\frac{1}{2}$ knots speed; each armed with one $5\frac{1}{2}$-inch gun. Also several smaller gunboats.
A first-class gunboat, No. 4, of 395 tons, in hand. A despatch vessel, 850 tons, laid down in 1902.

PORTUGAL.—Armoured Ship.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots	tons.	
b.	Vasco da Gama	3020	233	40	18¼	6000 W.T.	Blackwall Leghorn	1876 1903	1878	132,000	9¾-4	3	6 K.S.	..	7¾ K.S.	..	2 8-in., 4 4·7-in., 2 2·5-in., 2 1-pr., 4 M.	2 (sub.)	15·5 t	300	218

The Vasco da Gama has been reconstructed by Messrs. Orlando at Leghorn; she has been lengthened 23 ft., rearmed and reboilered.

Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
cr.	Adamastor	1993	250	35	14	4000	Leghorn	1896	1897	..	3	5	2 5·9-in., 4 4·7-in., 4 2·2-in., 4 M.	3	18·0 t	270	232
corv.	Affonso de Albuquerque	1111	203	33	13½	1360	Blackwall	1884	1885	56,500	..	..	2 6-in. (A.), 5 4·7-in., 2 2·5-in., 2 M.	..	13·3 t	140	183
g.v.	Bengo	462	125½	24½	9	400	Birkenhead	1879	1879	22,500	..	..	1 6-in., 2 3·4-in.	..	10·0	80	88
"	Diu	729	147	27½	13	700	Lisbon	1889	1891	..	..	..	1 5·9-in. (K.), 2 4·7-in., 1 3-pr., 2 M.	..	12·0	80	114
cr.	Dom Carlos I.	4100	360	46½	17½	12,500 Y.	Elswick	1898	1899	..	4	..	4 5·9-in. (A.), 8 4·7-in., 12 3-pr., 6 1-pr., 4 M.	5 (3 sub.)	22·0	1000	260
g.v.	Dom Luiz I.	721	151	27½	13¾	512	Lisbon	1895	1896	..	..	..	4 4·1-in., 3 2·5-in., 3 M.	..	9·9	100	..
"	Douro	587	142¾	26	11	400	Lisbon	1873 1877	1874	..	..	..	1 5·9-in. 4-ton, 2 4·7-in., 1 M.	..	10·0	85	107
g.v.	Liberal	580	140	25½	10½	580	Birkenhead	1884	1886	32,500	..	..	1 6-in. 4-ton (A.), 3 4-in., 2 M.	..	11·0	90	109
corv.	Mindello	1124	170	35¾	14	900	Blackwall	1876	1878	74,500	..	..	2 7-in. 4-ton M.L.R. (A.), 4 4·7-in. 2 M.	..	11·5	130	169
g.v.	Mandovi	462	125½	24½	9	400	Birkenhead	1879	1880	22,500	..	..	1 5·9-in., 2 3·4-in., 2 M.	..	10·0	80	86
g.v.	Patria	630	..	..	..	..	Lisbon	Bldg.	..	..	..	..	4 4-in., 6 1·8-in.	..	15·0	..	..
cr.	Rainha Amelia	1660	246	36	14¾	5000 Nor.	Lisbon	1899	1901	..	1	..	4 5·9-in., 2 3·9-in., 2 3-pr., 4 M.	2	20·6 t	..	250
"	Rio Lima	638	148½	27½	10½	500	Birkenhead	1875	1877	33,000	..	..	1 7-in. 4-ton (A.), 4 4-in., 2 M.	..	11·0	100	109
"	Sado	645	148½	28	10½	500	Birkenhead	1875	1877	35,500	..	..	1 7-in. 4-ton (A.), 4 4·7-in., 1 M.	..	11·0	100	109
cr.	São Gabriel / São Rafael	1800	246	35½	14¼*	4000 N.S.	Havre	1898	1899	..	1½	..	2 5·9-in. (Canet), 4 4·7-in., 8 1·8-in., 2 M.	1	17·5 t	500	200
g.b.	São Salvador	721	151	27½	13¾	..	Lisbon	Bldg.	..	..	..	..	4 4·1-in., 3 5·2 in., 3 M.	..	11·0	100	..
"	Tamega	645	148½	28	10½	500	Birkenhead	1875	1876	35,500	..	..	1 7-in. 4-ton (A.), 4 4·7-in., 1 M.	..	11·0	100	109
to.g.b.	Tejo	530	229½	23	..	7000	Lisbon	1901	1902	..	..	..	1 3-in., 6 1·8-in.	3	25·0	..	85
"	Vouga	730	160¾	27½	12	600	Lisbon	1882	1883	..	..	..	4 4 in., 2 1·8-in., 2 M.	..	10·0	100	109
"	Zaire	580	140	25½	10½	580	Birkenhead	1884	1885	32,500	..	..	1 6-in. (A.), 3 4-in., 2 M.	..	11·0	90	109
"	Zambeze	641	143	25¾	12	500	Lisbon	1886	1887	..	..	..	1 6-in. (A.), 2 4-in., 2 M.	..	10·0	85	107

* Mean draught.

Fifteen small gunboats and about 29 light-draught steel *river-gunboats*. *Two gunboats* of 220 tons, the Al Baptista de Andrade and Thomaz Andrea for Mozambique and Timor.

RUSSIA.—Armoured Ships.

(B.S., Black Sea Fleet.)

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkheads.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Second-ary.	Armament. Guns. B.L.R. are of Russian Krupp pattern.	Armament. Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
c.d.s., t.	Adm. Chichagoff	3505	254	42½	18	2060	St. Petersburg	1868	1870	..	..	..	..	..	6	..	2 *11-in.*, 4 *4-pr.*, 6 Q.F., 4 l.	..	10·5 *t*	300	264
,,	Adm. Greig *	3462	254	42½	17½	2031	St. Petersburg	1868	1870	..	4½	..	..	..	6	..	3 *11-in.*, 6 Q.F., 2 l.	..	10·0	300	280
,,	Adm. Lazareff	3462	254	43	17½	2004	St. Petersburg	1867	1869	..	4½	..	..	..	6	..	3 *11-in.*, 6 Q.F., 4 l.	..	10·25 *t*	300	280
a.c.	Adm. Nakhimoff shd.	8524	333	61	25	9000 B.	St. Petersburg	1885	1888 1900	572,000	10–6 *comp.*	3	..	..	8 *comp.*	..	8 *8-in.*, 10 *6-in.*, 10 Q.F. 4 *3-pr.*, 6 M.	4	16·7 *t*	1200	567
c.d.s.	Adm. Oushakoff	4126	265	52½	17	5000	St. Petersburg	1893	1895	410,000	10	3	..	..	7–8	..	4 *9-in.*, 4 *6-in.*, 6 *1·8-in.*, 8 M.	4	16·0	400	318
,,	Adm. Seniavin							1894	1895												
c.d.s., t.	Adm. Spiridoff	3505	254¼	42½	19	2007	St. Petersburg	1868	1870	..	6	..	..	..	6	..	2 *11-in.*, 4 *4 pr.*, 6 Q.F., 4 l.	..	10·5	300	260
b.	Alexander II. shd.	9927	326	67	23	8000	St. Petersburg	1887	1890	..	14–6 *comp.*	2½	..	6 *comp.*	10 *comp.*	6 *comp.*	2 *12-in.*, 4 *9-in.*, 8 *6-in.*, 4 *6-pr.*, 4 *3-pr.*, 6 M.	5	16·5 *t*	1200	604
b.	Alexander III. (Imperator)	13,600	367½	76	26	16,000 B.	St. Petersburg (Baltic)	1901	..	..	9–4 K.S.	4	6 K.S.	9 K.S.	10 K.S.	6 K.S.	4 *12-in.*, 12 *6-in.*, 20 *3-in.*, 20 *3-pr.*, 6 *1-pr.*	6 2 sub.	18·0	1250 2000	740
a.c.	Bayan	7800	443	55¾	22	17,400 *t* B.	La Soyne	1900	1902	..	8–3 K.S.	2	3 K.S.	..	7 K.S.	3 K.S.	2 *8-in.*, 8 *6-in.*, 20 *2·9-in.*, 7 *1·8-in.*	5 2 sub.	22 *t*	750 1100	..
b.	Borodino	13,600	367½	76	26	16,000 B.	St. Petersburg (New Admiralty)	1901	..	..	9–4 K.S.	4	6 K.S.	9 K.S.	10 K.S.	6 K.S.	4 *12-in.*, 12 *6-in.*, 20 *3-in.*, 20 *3-pr.*, 6 *1-pr.*	6 2 sub.	18·0	1250 2000	740
b.	Catherine II., B.S.	10,180	331	69	26½	10,600 B.	Nicolaieff	1886	1889	900,000	18–10 *comp.*	3	14 *comp.*	..	14 *comp.*	..	6 *12-in.*, 7 *6-in.*, 8 *6-pr.*, 6 M.	7	15·5 *t*	886	325
b.	Cesarevitch	13,110	388¾	76¼	26	16,300 B.	La Seyne	1901	1902	..	9¾–4 K.S.	2½	6 K.S.	9 K.S.	10–11 K.S.	6¾ K.S.	4 *12-in.*, 12 *6-in.*, 20 *3-in.*, 20 *1·8-in.*, 6 *1·4-in.*, 4 M., 2 l.	6 2 sub.	18·0	900 1350	732
a.c.	Dmitri Donskoi shd.	5882	296½	52	24¼	7000	St. Petersburg	1883	1885	..	6	2½	..	10	10	..	6 *6-in.*, 10 *4·7-in.*, 16 Q.F. and M., 4 l.	4	16·5	400	510
t.	Dvenadzat Apostoloff (Twelve Apostles), B.S.	8076	330	60	25½	11,500	Nicolaieff	1890	1892	..	14–6 *comp.*	2½	10 *comp.*	12 *comp.*	12 *comp.*	5 *comp.*	4 *12-in.*, 4 *6-in.*, 8 *3-pr.*, 10 M.	6	16·6 *t*	800	500
a.c.	General Admiral shd.	4722	285½	49¼	21	4472	St. Petersburg	1873	1875	..	6	..	..	..	..	..	6 *8-in.*, 2 *6-in.*, 10 Q.F. and M., 5 l.	4	14·2 *t*	1000	312
c.d.s.	General Admiral Apraxine	4200	277½	52½	17½	5757 *t*	St. Petersburg (New Admiralty)	1896	1898	..	10 H.S.	3	..	..	7·8 K.S.	..	3 *10-in.*, 4 *6-in.*, 6 *1·8-in.*, 8 *1·4-in.*	4	15·0 *t*	215	318
a.c.	Gertzog Edinburgski	5050	285½	49¼	21	5222	St. Petersburg	1875	1877	..	6	..	..	..	6	..	4 *8-in.*, 5 *6-in.*, 12 Q.F., 6 l.	2	15·2 *t*	1000	500
b.	Georgi Pobiedonosetz (George the Victorious), B.S.	10,280	320	69	26½	10,600 13,468 *t*	Sebastopol	1892	1896	†431,000	16–11	..	12	..	12	..	6 *12-in.*, 7 *6-in.*, 8 *3·9-in.*, 6 M.	7	16·5 *t*	700	500
a.g.b.	Gremiastchy	1500	225	41	11	2500 B.	St. Petersburg	1892	1893	..	5	1½	..	3½	..	..	1 *9-in.*, 1 *6-in.*, 10 Q.F.	2	15·0	100	142
a.c.	Gromoboi shd.	12,336	473	68½	26	14,500	St. Petersburg (Baltic)	1899	1900	..	6 H.S.	3	4¾ H.S.	6 H.S.	6 H.S.	4¾ H.S.	4 *8-in.*, 16 *6-in.*, 6 *4·7-in.*, 20 *3-in.*, 36 small Q.F. and M.	5 4 sub.	20·0	2500	814
a.g.b.	Grozjastchy	1492	229	41¾	11	2000 B.	St. Petersburg	1890	1891	..	5	1½	..	3½	..	..	1 *9-in.*, 1 *6-in.*, 8 Q.F.	2	15·0	100	120
,,	Khrabry	1492	229	41¾	11	3030 Nic.	St. Petersburg (New Admiralty)	1895	1896	..	5	1½	..	3½	..	..	1 *9-in.*, 1 *6-in.*, 8 Q.F.	2	15·0	100	120
t.	Kniaz Potemkine Tavritchesky, B.S.	12,480	372¼	72¾	27	10,600 B.	Nicolaieff	1900	1902	..	9 3 K.S.	2½	6 K.S.	7–5 K.S.	12–10 K.S.	5 K.S.	4 *12-in.*, 16 *6-in.*, 14 *3-in.*, 6 *1·8-in.*, 14 *1·4-in.*, 6 M., 2 l.	5 sub.	17·0	670‡	636
b.	Kniaz Souvaroff	13,516	367½	76	26	16,000 B.	St. Petersburg (Baltic)	1902	..	..	9–4 K.S.	4	6 K.S.	10 K.S.	10 K.S.	6 K.S.	4 *12-in.*, 12 *6-in.*, 20 *3-in.*, 20 *3-pr.*, 6 *1-pr.*	6 2 sub.	18·0	1250 2000	740
t	Navarin	10,206	338	67	25	9000	St. Petersburg	1891	1895	772,995	16 *comp.*	3	12 *comp.*	12 *comp.*	12 *comp.*	5 *comp.*	4 *12-in.*, 8 *6-in.*, 14 Q.F., 4 l.	6	16·0	1200	630

* To be fitted with new boilers. † Exclusive of armament. ‡ And liquid fuel, 580 tons.

RUSSIA.—Armoured Ships—*continued.*

(B.S., Black Sea Fleet.)

Class	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Second-ary.	Armament. Guns. B.L.R. are of Russian Krupp pattern.	Armament. Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
t.	Nicolai I. . shd	9672	326	67	23	8000 B.	St. Petersburg	1888 1900	1892	153,000§	14–6 comp.	2½	..	..	10 comp.	6 comp.	2 12-in., 4 9-in., 8 6-in., 12 Q.F., 8 M., 4 l.	6	14·8 t	..	604
b.	Orel . .	13,600	367½	76	26	16,000 B.	St. Petersburg (Galerny)	1902	..	..	9–4 K.S.	4	6 K.S.	9 K.S.	10 K.S.	6 K.S.	4 12-in., 12 6-in., 20 3-in., 20 3-pr., 6 1-pr.	4 (2 sub.)	18·0	1250 / 2000	740
t.	Oslabya .	12,674	401½	71½	26	14,500	St. Petersburg (New Admiralty)	1898	1901	..	9½ H.S.	2¾	6 H.S.	9 H.S.	9 H.S.	6 H.S.	4 10-in., 11 6-in., 16 3-in., 10 1·8-in., 17 1·4-in., 2 l.	6	18·0	1063 / 2056	732
g.b.	Otvazny . .	1500	225	41	11	2000 2589 t B.	St. Petersburg	1892	1894	..	5	1½	..	3½	..	..	1 9-in., 1 6-in., 10 Q.F.	2	15.5	100	142
a.c.	Pamyat Azova* . shd	6675	377	51	23	8000	St. Petersburg	1888	1890	350,000	9 comp.	2½	..	8 comp.	8 comp.	..	2 8-in., 13 6-in., 14 Q.F., and 3 M.	7	t 18·8 t	1000	525
t.	Peresviet .	12,674	401¼	71¾	26	14,500	St. Petersburg. (Baltic)	1898	1891	..	9–7 H.S	2¾	6 H.S.	9 H.S.	9 H.S.	6 H.S.	4 10-in., 11 6-in., 16 3-in., 10 1 8-in., 17 1·4-in., 2 l.	6	18·0	1063 / 2056	732
t.	Peter Veliky .	9391	328¼	62½	23¾	8258	St. Petersburg	1872	1875	..	14–8	3	8	..	8	..	4 12-in., 4 8 4-in., 13 Q.F., 4 l.	1	14·5 t	1200	436
t.	Petropavlovsk	10,960	367½	69	26	14,213 t	St. Petersburg	1894	1898	1,098,000	15¾	3½	4	9	10 H.S.	6	4 12-in., 12 5 9-in., 34 smaller.	6	16·3 t	900	700
t.	Poltava. .	10,960	367½	69	26	11,255 t	St. Petersburg	1894	1893	1,098,000	15¾	3½	4	9	10 H.S.	6	4 12-in., 12 5 9-in., 34 smaller.	6	16·2 t	900	700
b.	Pobieda (Victory)	12,674	401¼	71½	26	14,500 B.	St. Petersburg (Baltic)	1900	1891	..	9½–4 H.S.	2¾	9 H.S.	9 H.S.	9 H.S.	6 H.S.	4 10-in., 11 6-in., 16 3-in., 10 1 8-in., 17 1·4-in., 2 l.	6	18·0	1063 / 2056	732
b.	Retvizan .	12,700	374	72½	25	16,000 Nic.	Philadelphia	1900	1902	..	9–4 K.S.	4	6–2 K.S.	9 K.S.	10 K.S.	5 K.S.	4 12-in., 12 6-in., 20 3-in., 20 3-pr., 6 1-pr.	..	18·0	1016 / 2000	..
a. c.	Rossia . . shd.	12,130	480	68½	26	14,500 B.	St. Petersburg	1896	1898	..	10–5 H.S.	2½	4 H.S.	6 H.S.	2 H.S.	2 H.S.	4 8-in., 16 6-in., 12 3-in., 36 small Q.F. & M.	5	20·0	2500 ‡	725
t.	Rostislav, B.S.	8880	341	66½	24	8500	Nicolaieff	1896	1899	..	15¾–8 H.S.	2–3	5 H.S.	5 H.S.	15¾ H.S.	6 H.S.	4 10-in., 8 5·9-in. (Canet), 12 1·8-in., 4 1·5-in., 2 M.	2–3	16·0	‡550 / 800	624
a. c.	Rurik . . shd.	10,923	396½	67	26	13,250	St. Petersburg	1894	1895	..	10–5 comp.	2½	..	10 H.S.	..	2 H.S.	4 8-in., 16 6-in., 6 4·7-in., 18 small Q.F. & M.	5	18·7 t	2000	768
t.	Sevastopol	10,960	367½	69	26	13,600	St. Petersburg	1895	1899	1,098,000	15¾	3½	..	9	10 H.S.	6	4 12-in., 12 5·9-in., 34 smaller.	6	17·5 t	900	700
b.	Sinope, B.S.†	10,180	331	69	26½	13,000 B.	Sebastopol	1887	1890	900,000	16–11 comp.	3	14 comp.	12	14 comp.	..	6 12-in., 7 6-in., 8 Q.F., 6 M.	7	16·75 t	886	325
t.	Sissoi Veliky (Sissoi the Great)	8880	341	66½	24	8500	St Petersburg.	1894	1897	796,333	15¾ H.S.	3	5 H.S.	5 H.S.	14 H.S.	5 H.S.	4 12-in., 6 6-in., 12 1·8-in., 4 1·4-in., 2 M.	6	16·0	550	590
b.	Slava . .	13,600	376½	76	26	16,000 W.T.	St. Petersburg (Baltic)	Bldg.	..	..	9–4 K.S.	4	6 K.S.	9 K.S.	10 K.S.	6 K.S.	4 12-in., 12 6-in., 20 3 in., 20 3-pr., 6 1-pr.	4 (2 sub.)	18·0	1250 / 2000	710
"	Tchesmé, B.S.	10,180	331	69	26½	11,000	Sebastopol	1886	1888	900,000	16 comp.	3	14 comp.	..	14 comp.	..	6 12-in., 7 6-in., 8 Q.F., 6 M.	7	15·0	886	325
"	Tria Sviatitelia, B.S.	12,480	357½	72½	27	10,600	Nicolaieff	1893	..	..	16 H.S.	3	16 H.S.	12 H.S.	16 H.S.	5 H.S.	4 12-in., 8 6-in., 4 4-in., 4 7-in., 56 smaller Q.F. & M.	6 (2 sub.)	18·0 t	1000	582
cir.	Vladimir Monomach . shd.	6061	296½	52	24	7000	St. Petersburg	1882	1885	..	10–6 comp.	2	..	..	..	..	5 8-in., 12 6-in., 18 Q.F. & M., 4 l.	2	15 2 t	400	550

* To receive Belleville boilers and be reconstructed. † To receive new boilers and undergo machinery repairs. ‡ And liquid fuel. § Exclusive of armament.

RUSSIA.—Cruising Ships, &c.

(B.S., Black Sea Fleet.)

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	ins.				knots.	tons.	
to.g.b.	Abrek	535	212¼	24¾	9	4506 t	Abo	1896	1897	53,600	½	..	2 3-in., 4 1·8-in.	2	21·2 t	..	..
2nd cl. cr.	Admiral Korniloff	5000	351	48½	20	9000	St. Nazaire	1887 1895	1889	296,000	2½	..	2 8-in., 14 6-in., 6 1·8-in., 6 1·4-in., 5 l.	6	17·5 t	1100	425
cr.	Afrika	2590	285½	39½	17	1350	Chester, U.S.	1877	1879	..	..	..	3 6-in., 6 Q.F., 4 M., 4 l.	..	13·0	975	257
cr.	Almaz	2385	325	43½	17½	17,500 B.	St. Petersburg (Baltic)	Bldg.	..	..	2¾	5–3½ K.S.	6 4·7-in., 8 1·8-in., 2 1·4-in., 3 M.*	6	19·0	560	340
cr.	Asia	2500	269	36	16½	1100	Philadelphia	1878	1880	..	..	..	2 6-in., 5 Q.F., 6 M., 5 l.	..	13·0	750	260
cr.	Askold	6100	426½	49¼	20¾	24,000 T.S	Kiel (Germania)	1900	1901	..	3	4	12 6-in., 12 3-in., 8 1·8-in., 2 1·4-in., 2 M.	6 (2 sub.)	23·8 t	720 1100	500
cr.	Aurora	6630	413½	55¾	21	11,610 B.	St. Petersburg (Galerny)	1900	1902	..	2½	..	8 6-in., 20 3-in., 8 1·4-in.	4	20·0	900 1400	422
to.g.b.	Bakan (Mining) sld.	840	180½	15½	11½	3800 B.	St. Petersburg (Baltic)	1896	1897	..	..	..	4 Q.F.	..	12·0	..	..
g.v.	Bobr	950	187	35¼	9½	1150	Kretona	1884	1885	43,000	..	..	1 9-in., 1 6-in., 5 Q.F., M. & 6 l.	..	12·0	..	..
cr.	Bogatyr	6750	416¾	54½	20¾	20,500 Nor.	Stettin (Vulcan)	1900	1902	..	2	5 N.S.	12 6-in., 12 3-in., 6 1·8-in., 2 1·4-in., 2 M.	6 (2 sub.)	23·4 t	720 1100	580
cr.	Boyarin	3200	347¾	41½	16	18,000 B.	Copenhagen	1900	1902	..	2	..	6 4·7-in., 8 1·8-in., 2 1·4-in., 3 M.	6 (1 sub.)	25·0	600	334
to.g.b.	Captain Sacken, B.S.	742	210	24	8¾	3400	Nicolaieff	1888	1889	40,700	..	..	7 4·7-in., 7 M.	6	18·5 t	97	120
g.v.	Chernomoretz, B.S.	1224	210	35	11	2000	Nicolaieff	1889	1891	40,000	..	..	2 8-in., 1 6-in., 7 Q.F. & M.	2	13·5 t	250	161
"	Coreetz	1213	206	35	10½	1500	Stockholm	1886	1887	..	1½	..	2 8-in., 1 6-in., 2 Q.F., 4 l.	2	13·5 t	..	..
cr.	Diana	6630	413½	55¾	21	11,610 B.	St. Petersburg (Galerny)	1899	1902	..	2½	..	6 6-in., 20 3-in., 8 1·4-in.	4	20·0	900 1400	422
corv.	Djigit	1456	206¾	32¾	16	1700	St. Petersburg	1876	1877	..	..	..	3 6-in., 8 Q.F. & M., & 4 l.	..	13·0	250	172
"	Donetz, B.S.	1224	210	35	11	2000	Nicolaieff	1887	1888	40,000	..	..	2 8-in., 1 6-in., 7 Q.F. & M.	2	13·5 t	250	161

* Armament doubtful. Almaz to be launched May, 1903.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
to.g.b.	Gaidamak	500	192½	24¼	7½	3000	Abo	1893	1894	..	..	..	2 1·8-in., 7 1·4-in., 10 M.	3	22·0	90	87
g.v.	Gilyak	963	200	37	9¼	1000 B.	St. Petersburg (New Admiralty)	1897	1898	..	..	2	1 4·7-in., 5 3-in., 2 2·6-in., 4 1·8-in.	1	12·0	..	150
to.g.b.	Griden, B.S.	400	192½	24¼	7½	3500	Nicolaieff	1893	1894	66,600	..	..	2 1·8-in., 7 1·4-in., 10 M.	3	22·0	90	60
cr.	Izumrud	3100	347¾	41½	16	17,000 Y.	St. Petersburg (Nevsky)	Bldg.	..	..	2	..	6 4·7-in., 8 1·8-in., 2 1·4-in., 3 M.	6	24·0	600	340
cr.	Jemtchug																
cr.	Kagul	6250	436	52	20½	19,500	Nicolaieff	Bldg.	..	..	2¾	5–3½ K.S.	12 6-in., 12 3-in., 8 1·8-in.	5 (2 sub.)	23·0	720	..
to.g.b.	Kazarsky, B.S.	400	190	24	8½	3500	Elbing	1890	1891	32,500	..	..	9 1·8-in. (Hotchkiss)	2	23·0	90	60
corv.	Kreisser	1653	206¾	32¾	16	1800	St. Petersburg	1875	1876	..	..	..	2 6-in., 7 Q.F., 1 M., 4 l.	..	13·0	..	..
g.v.	Kubanetz, B.S.	1224	210	35	11	1500 B.	Sebastopol	1888	1889	40,000	..	..	2 8-in., 1 6-in., 7 Q.F.	2	13·8 t	250	161
to.g.b.	Lieutenant Ilyin	714	230	24	8¾	3500	St. Petersburg	1887	1888	40,150	..	..	7 3-pr., 10 M.	7	20·1 t	97	120
g.v.	Mandjur	1416	210	35	11	1400	Copenhagen	1886	1887	..	1½	..	2 8-in., 1 6-in., 7 Q.F., M., & 4 l.	2	14·0	160	179
corv.	Nayezdnik	1334	206¾	32¾	14	1719	St. Petersburg	1878	1879	..	..	..	3 6-in., 7 Q.F. & M., 4 l.	..	13·0	250	172
cr.	Novik	3200	347¾	41½	16	18,000 T.S.	Danzig (Schichau)	1900	1902	..	2	..	6 4·7-in., 8 1·8-in., 2 1·4-in., 3 M.	6	25·0	600	310
cr.	Oleg	6670	433¾	54½	20½	18,000 T.S.	St. Petersburg (New Admiralty)	Bldg.	..	..	2¾	5–3½	6 4·7-in., 8 1·8-in., 2 1·4-in., 3 M.	6	25·0	600	340
corv.	Oprichnik	1426	206¾	32¾	14	1268	St. Petersburg	1880	1881	..	..	..	3 6-in., 7 Q.F. & M., 4 l.	..	13·0	230	172
cr.	Otchakoff	6670	434	54½	20½	19,500 Nor.	Sebastopol	1902	..	..	2¾	5–3½ K.S.	12 6-in., 12 3-in., 6 M.	2 sub.	23 0	720 1100	..
cr.	Pallada	6630	413½	55¾	21	11,610 B.	St. Petersburg (Galerny)	1899	1902	..	2½	..	6 6-in., 20 3-in., 8 1·4-in.	4	20·0	900 1400	422
3rd cl. cr.	Pamyat Merkuriya, B.S.	3050	295	41	17	3000	Toulon	1880	1882	..	..	..	6 6-in., 8 Q.F. & M., 4 l.	2	16·0	1100	200
sl.	Plastun	1255	206¾	32¾	14	1268	St. Petersburg	1879	1880	..	..	..	3 6-in., 7 Q.F. & M., & 4 l.	..	13·0	250	172
to.g.b.	Posadnik	462	192½	24¼	7½	3600	Elbing	1892	1892	111,000	..	..	2 1·8-in., 7 1·4-in., 3 M.	3	22·0	90	87

RUSSIA.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
corv.	Razboynik	1320	206¾	32¾	14	1786	St. Petersburg.	1878	1880	125,000	..	..	3 *6-in.*, 7 Q.F. & M., & 4 l.	..	13·0	250	172
3rd cl. *cr.*	Rynda	3508	265¾	46	16	3000	St. Petersburg.	1885	1887	..	1½	..	10 *6-in.*, 9 Q F., M, & 4 l.	4	14·8 *t*	710	322
g.v.	Sivootch	950	187	35	9½	1125	Stockholm	1884	1885	43,000	..	..	1 *9-in.*, 1 *6-in.*, 5 Q F., M., & 6 l.	..	12·5 *t*	..	170
corv.	Strjelok	1343	206¾	32¾	14	1528	St. Petersburg.	1880	1881	..	..	..	3 *6 in.*, 7 Q.F., M, & 4 l.	..	13·0	250	172
cr.	Svietlana	3828	331¼	42¾	18¾	3828 B.	Havre	1896	1897	..	2	4	6 *5·9 in.* (*Canet*), 10 *1·8-in.*	4	20·2 *t*	1000	360
g.v.	Teretz, B.S.	1224	210	35	11	1500 B.	Sebastopol	1888	1889	40,000	..	..	2 *8-in.*, 1 *6-in.*, 7 Q.F. & M.	2	13·8 *t*	250	161
g.v.	Uraletz, B.S.	1224	210	35	11	1500 B.	Sebastopol	1888	1890	40,000	..	..	2 *8-in.*, 1 *6-in.*, 7 Q F. & M.	2	13·8 *t*	250	161
cr.	Varyag	6500	420	52	20¾	20,000 Nic.	Philadelphia	1899	1900	..	3	..	12 *6-in.*, 12 *3 in.*, 6 *1·4* (*Hotchkiss*).	6 (2 sub.)	23·0	770 / 1250	571
cr.	Vitiaz	6375	414	52½	20¾	20,000 B.	St. Petersburg (Galorny)	Bldg.	..	..	2¾	5-3½ K.S.	12 *6-in*, 12 *3-in.*, 8 *1·8-in.*	5 (2 sub.)	23·0	720	..
sl.	Vjestnik	1255	206¾	32¾	14¼	1268	St. Petersburg.	1879	1880	..	..	..	3 *6-in*, 7 Q.F. & M., & 4 l.	..	13·0	250	172
to.g.b.	Voevoda	400	192½	24¼	7½	3600	Elbing	1892	1902	111,000	..	..	2 *1·8-in.*, 7 *1·4-in.*, 3 M.	3	22·0	90	87
to.g b.	Vzadnik	400	192½	24¼	7½	3000	Abo	1893	1894	..	..	..	4 *1·8-in.*, 7 *1·4-in.*, 10 M. & 1.	3	22·0	90	97
sl.	Zabiyaka	1234	219¾	29½	14¾	1194	Philadelphia	1878	1879	..	..	..	6 Q F., 4 M., 5. l.	..	14·5 *t*	250	172
g.v.	Zaporojetz	1224	210	35	10	1500	Nicolaieff	1887	1889	40,000	..	..	2 *8-in.*, 1 *6-in.*, 7 Q.F. & M	2	13·5 *t*	250	161
cr.	Two unnamed* (Oleg cl)	6670	..	..	..	17,000 Y.	St. Petersburg (Nevsky)	Bldg.	..	..	..	..	..	..	20·0	..	..
cr	One unnamed* (Novik cl)	3200	..	..	..	..	Danzig (Schichau)	Bldg.	..	..	..	..	..	..	..	..	..

Baltic:—*Ten Gunboats* (*Staunch Class*), of 270 to 402 tons, 195 to 445 I.H.P., with 1 11-inch breech-loader, and 9 knots speed, and *two Gunboats* of about 180 tons and 7 knots speed. *Training Ships*, Bajan, Voin, Vierny, and Moriak. Ermach, very powerful ice-breaker. Black Sea:—*Twelve Steamers* (*Gun-vessels, Despatch-vessels, &c.*), 90 to 298 tons. *Imperial Yachts*, Standart, Polarnaia Svezda, Tsarevna, &c. Okean, *coal transport*, 12,000 tons, 18 knots, launched at Kiel, 1901. She will carry 4000 tons of coal, and steam 10,000 miles, with 800 tons as her own supply, at reduced speed; fitted with Thornycroft, Schulz, Yarrow, Belleville and Niclausse boilers for instructional purposes. *Kamtschatka*, troopship, launched at the new Admiralty Yard, St. Petersburg, Nov. 1, 1902.

* It is stated that a special committee has reported against the further construction of vessels of these classes, larger displacements being advocated.

Auxiliary Steamers.

Class.	NAME.	Material of Hull.	Displacement.	Length.	Beam.	Draught.	Propellers.	Indicated Horse-Power.	Where Built.	Date of Launch.	Speed.
	BLACK SEA CO.		tons.	ft. in.	ft. in.	ft. in.					
Auxiliary Cruiser	Czar	S.	2340	319 0	37 0	23 6	1	350 nom.	Newcastle	1883	14
,,	Czarevna	,,	2340	319 0	37 0	23 6	1	350 nom.	,,	1883	14
,,	Czaritza	,,	2310	319 0	37 0	23 6	1	350 nom.	,,	1883	14
,,	Grand Duke Alexis	,,	2350	284 0	37 0	14 9	1	3500	Hebburn	1890	16
,,	Grand Duke Constantine	,,	2100	284 0	37 0	15 0	1	3500	,,	1891	16
,,	Grand Duke No. 1	,,	2400	288 0	37 0	15 0	1	2500	,,	Bldg.	14½
,,	Grand Duke No. 2	,,	2400	288 0	37 0	15 0	1	2500	,,	,,	14½
,,	Emperor Nicolas II.	,,	..	..	..	..	..	..	,,	1895	..
,,	Roumantzeff	,,	760	212 0	28 0	7 6	2	1000	,,	1894	13
	VOLUNTEER FLEET.										
,,	Ekaterinoslav	,,	10,500	410 0	49 6	24 0	2	3200	,,	1896	12
,,	Khabarovsk	I.	2700	265 0	36 0	14 6	2	1800	,,	1894	13
,,	Kherson*	S.	10,225	493 0	54 3	24 0	2	12,500 B.	,,	1895	19½
,,	Kiev	,,	10,500	440 0	49 6	24 0	2	3200	Clydebank	1895	13
,,	Kostroma	I.	7975	360 0	42 0	23 6	1	2700	Hebburn	1888	14
,,	Moskva*	S.	11,700 B.	508 0	58 0	25 0	2	12,500 B.	Clydebank	1898	20
,,	Nijni Novgorod	I.	7876	325 0	40 0	23 6	1	2000	Elswick	1891	11½
,,	Orel	,,	7990	445 0	48 0	23 6	2	10,000	Hebburn	1889	19
,,	Petersburg	,,	9252	460 0	52 0	24 0	2	11,000	,,	1894	19
,,	Poltava	S.	10,225	493 0	54 3	24 0	2	12,500	Dumbarton	Bldg.	19½
,,	Saratoff	,,	8556	462 0	50 0	24 0	2	10,000	Glasgow	1892	19
,,	Smolensk	,,	11,850 B.	506 6	58 0	24 0	2	16,500 B.	Newcastle (Hawthorn)	1901	20
,,	Tamboff	,,	8640	385 0	45 0	24 6	1	2,500	Dumbarton	1893	12¾
,,	Vladimir	,,	10,500	440 0	49 6	24 0	2	3,200	,,	1895	12
,,	Voronej	,,	10,500	410 0	49 6	24 0	2	3,200	,,	1895	12
,,	Yaroslav	,,	8640	385 0	45 0	24 6	1	2,500	,,	1893	12¾

It is stated that ten of the most recent of the Volunteer steamers are to be withdrawn from the Service and added as cruisers to the Naval Reserve.

* Armament, 3 4·7-in. Q.F., 20 smaller.

SPAIN.—Armoured Ships.

Class	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
a.c.	Cardenal Cisneros	7000	347¾	61	21¾	15,000	Ferrol .	1896	1902	600,000	12–10	2	..	12	10½	..	2 *11-in.*, 10 *5·5-in.*, 2 *2·7-in.* 4 *2·2-in.*, 4 *1·4-in.*, 2 M.	5	20·7 t	1200	500
a.c.	Cataluña .	7000	347¾	61	21¾	15,000	Cartagena	1900	..	600,000	12–10	2	..	12	10½	..	2 *11-in.*, 10 *5·5-in.*, 2 *2·7-in.*, 4 *2·2-in.*, 4 *1·4-in.*, 2 M.	5 sub.	20·0	1200	484
a.c.	Emperador Carlos V.	9235	380	67	25	18,500	Cadiz (Vea Murguia)	1895	1898	734,000	2	6½–2	2	..	10	2	2 *11-in.* (Hontoria), 8 *5·5-in.*, 4 *3·9-in.*, 2 *2·7-in.*, 4 *2·2-in.*, 6 M.	6	20·0	1200	535
br.	Numancia .	7305	314¾	55¾	25¼	3708	La Seyne	1863 1897	1865	315,600	5½	..	4¾	..	5	4¾	4 *8-in.*, 4 *6·2-in.*, 10 *5·9-in.*	2	8·0	1100	600
b.	Pelayo .	9960	330	66	25	9000 Nic.	La Seyne	1887 1897	1890	..	17¾	4	..	..	19½	4 H.S.	2 *12·5-in.*, 2 *11-in.*, 9 *5·5-in.*, 6 smaller, 12 M.	7	16·0	800	600
a.c.	Princesa de Asturias	7000	347¾	61	21¾	15,000	Carraca	1896	..	600,000	12–10	2	..	12	10½	..	2 *11-in.*, 10 *5·5-in.*, 2 *2·7-in.*, 4 *2·2-in.*, 4 *1·4-in.*, 2 M.	5	20·0	1200	500
br.	Vitoria (training)	7250	318¼	55¾	25¼	4500	Blackwall	1865	1867	..	5½–3	..	5½	..	5	5	4 *8-in.*, 4 *6·4-in.*, 10 *5·9-in.*, 4 *1·8-in.*, 2 l., 6 M.	2	11·0	875	561

SPAIN.—Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	ins.				knots.	tons.	
cr.	Alfonso XII.	3090	278¾	42½	16½	4800	Ferrol	1887	1890	..	..	..	6 *6·2-in.* (Hontoria), 2 *2·7-in.*, 6 *6-pr.*, 4 *3-pr.*, 5 M.	5	17·5 t	600	300
cr.	Alfonso XIII.*	5000	318½	50½	20	11,000	Ferrol	1891	1893	..	4½	..	4 *7·8-in.* (Hontoria), 6 *4·7-in.*, 6 *2·2-in.*, 6 *1·4-in.*, 3 M.	5	20·0	1200	270
cr.	Aragon*	3342	246	46	21	4400	Cartagena	1879	1882	..	..	..	6 *6·2-in.* (Hontoria), 2 *3·6-in.* (K.), 4 *2·9-in.*, 2 M.	2	14·0	470	300
g.b.	General Concha	524	157½	25½	8½	600	Ferrol	1883	1884	..	..	..	3 *4·7-in.* (Hontoria), 2 Q.F., 1 M.	1	11·0	80	93
cr.	Conde de Venadito	1130	210	32	12½	1600	Cartagena	1888	1890	..	..	..	4 *4·7-in.* (Hontoria), 2 *2·7-in.*, 2 Q.F., 5 M.	2	14·0	220	130
to.g.b.	Don Alvaro de Bazán	823	233	26¾	22	2500	Ferrol	1897	1899	..	..	..	2 *4·7-in.* (Hontoria), 4 *1·6-in.*, 2 M.	4	19·0	..	110
to.g.b.	Doña María de Molina	823	233	26¾	22	2500	Ferrol	1896	1898								
to.g.b.	Destructor	458	192½	25	7	3800	Clydebank	1887	1888	..	..	..	1 *3·5-in.*, 4 *6-pr.*, 4 M.	3	22·56 t	104	55
cr.	Extremadura	2030	290	36	14	7000 T	Cadiz	1900	1902	..	2	..	8 *4-in.* (Vickers), 4 *2·2-in.*, 2 *1·4-in.*, 1 l.	..	20·0	..	..
to.g.b.	Filipinas	750	213	27	8½	4600	Cadiz	1892	1893	..	..	..	2 *4·7-in.*, 4 *1·5-in.*, 4 M.	4 sub.	20·0	120	110
to.g.b.	Galicia	571	190	23	10½	2600	Ferrol	1891	1892	..	..	..	2 *4·7-in.* (Hontoria), 4 *2·2-in.*, 1 M.	2	19·0	106	80

* Do not any longer appear in the Fleet List.

SPAIN.—Cruising Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	ins.	ins.			knots.	tons.	
g. v.	General Lezo	524	157½	25½	8½	600	Cartagena	1885	1886	..	..	..	2 *4·7-in.* (Hontoria), 1 *3·5-in.*, 2 Q.F., 1 M.	2	11·0	80	97
sl.	Infanta Isabel	1130	211	32¼	12½	1500	Cadiz	1885	1887	..	..	..	4 *4·7-in.* (Hontoria), 2 *2·7-in.*, 3 Q.F., 4 M.	2	14·0	220	130
sl.	Isabel II.	1130	211	32¼	12½	1500	Ferrol	1886	1888								
cr.	Lepanto	4826	318½	50½	20	12,000	Cartagena	1892	1895	..	4¾	..	4 *7·8-in.* (Hontoria), 6 *4·7-in.*, 6 *6-pr.*, 4 *3-pr.*, 5 M.	5	20·0	1100	276
gv.	Magallanes	524	157½	25½	8½	600	Cadiz	1885	1887	..	..	..	3 4 *7-in.* (Hontoria), 3 M.	1	11·0	80	97
to.g.b.	Marqués de la Victoria	823	233	26¾	22	2500	Ferrol	1897	1900	..	..	..	2 *4·7-in.* (Hontoria), 4 *1·6-in.*, 2 M.	4	19·0	..	110
cr.	Marqués de la Enseñada*	1030	185	30	11½	1600	Carraca	1890	1893	..	2½	..	4 *4·7-in* (Hontoria), 5 Q.F., 4 M.	4	15·0	160	164
g.v.	Marqués de Molins	571	190	23	10¼	2600	Ferrol	1891	1893	..	..	..	2 4 *7-in.* (Hontoria), 4 *2·2-in.*, 1 M.	2	12·0	106	80
g.v.	Martin Alonso Pinzón	571	190	23	10¼	2600	Ferrol	1892	1893								
cr.	Navarra	3342	233	42½	20¼	4400 Nic.	Ferrol	1881	1883	..	..	..	4 *5·9-in.*, 2 *4·7-in.*, 2 *3·4-in.*, 4 2 *9-in.*, 4 M.	2	14·0	470	300
g.v.	Nueva España	630	190	23	11¾	2600	Carraca	1889	1890	..	..	..	2 *4·7-in.* (Hontoria), 4 *2 2-in.*	2	14·0	106	91
g.v.	Rapido	570	190	23	10¼	2600	Carraca	1891	1893	..	..	..	2 *4·7-in.* (Hontoria), 4 *2 2 in.*, 1 M	2	14·0	106	80
cr.	Reina Regente	5372	337	520	19¾	6500 W.T.	Ferrol	Bldg.	..	..	..	3	10 *5·5-in.*, 12 *2·2-in.*, 2 1., 8 M.	3	20·0	..	..
cr.	Rio de la Plata† shd.	1800	246	35¼	15	7100 N.S.	Havre	1893	1899	..	..	1	2 *5·5 in*, 4 *3·9-in.*, 4 *2·2-in.*, 6 M.	2	20·0	270	213
g.v.	Temerario	570	190	23	10¼	2600	..	1889	1890	..	..	..	2 *4·7-in.* (Hontoria), 4 *2 2-in.*, 1 M.	2	15·0	106	82
g.v.	Vincente Yáñez Pinzón	571	190	23	10¼	2600	Ferrol	1891	1892	..	..	..	2 *4·7-in.* (Hontoria), 4 *2 2-in.*, 1 M.	2	12·0	106	80

Fernando el Catolico, 500 tons, torpedo training ship. Hernán Cortés, Vasco Nuñez de Balboa, Ponce de Léon, MacMahon, gunboats.

* Said to have been struck off the list. † A sister vessel, the General Linares, is stated to be in hand.

SWEDEN.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Secondary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
c.d.s., t.	Aeran . .	3670	287	49¼	16½	6500 Y.	Gothenburg	1901	1902	..	7 K.S.	1⅛	..	..	7½ K.S.	5 K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 2 *1·4-in.*, 2 M.	2 sub.	17·2 *t*	370	250
c.d.s., t.	Dristigheten .	3500	285	48½	16	5400 Y.	Gothenburg	1900	1901	..	8 K.S.	1⅛	..	..	8 N.S.	3¾ K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 2 M.	2 sub.	16·5	300	..
a.c.	Fylgia . .	4600	377½	48¾	16	12,000 Y.	Stockholm .	Bldg.	..	350,000	4 K.	2	..	..	4 K.	..	8 *5·9-in.*, 14 *2·2-in.* . .	2	21·5 *t*	350 / [?]00	..
c.d.s., t.	Göta* . .	3290	258½	48	16¾	4750	Gothenburg	1890 1902	1891	..	11¾-8	2	..	..	7½ H.S.	5 H.S.	2 *10-in.*, 4 *6-in.*, 5 *2·2-in.*, 8 M.	3	16·0	240	150
c.d.s., t.	Manligheten .	3670	287	49¼	16½	6000 Y.	Malmö .	Bldg.	..	..	7 K.S.	1⅛	..	..	7½ K.S.	5 K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 2 *1·4-in.*, 2 M.	2 sub.	16·5	370	250
„	Njord . .	3500	278¼	48½	17½	53:0	Gothenburg	1898	1899	..	9½ H.N.S.	1⅛	..	..	9⅞ H.N.S.	3¾ H.N.S.	2 *9·8-in.*, 6 *4·7-in.*, 10 *2·2-in.*, 4 M.	1	16·5	275	200
„	Oden . .	3500	278¼	48½	17½	!330	Stockholm .	1896	1898	..	9½ H.N.S.	1⅛	..	..	9⅞ H.N.S.	3¾ H.N.S.	2 *9·8-in.*, 4 *4·7-in.*, 10 *2·2-in.*, 4 M.	1	16·5	275	200
c.d.s., t.	Svea* . .	3100	248¼	49¼	17	3640	Gothenburg	1886	1887	..	11¾-8	2	..	..	11½	..	2 *10-in.* (A.), 4 *4·7-in.*, 6 *2·2-in.*, 8 M.	1	14·7 *t*	220	268
c.d.s., t.	Tapperheten .	3670	287¼	49¼	16½	6000 Y.	Malmö .	1901	..	..	7 K.S.	1⅛	..	..	7½ K.S.	5 K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 2 *1·4-in.*, 2 M.	2 sub.	16·5	370	2:0
„	Thor . .	3500	278¼	48½	17½	5250	Stockholm .	1898	1890	..	9½ H.N.S.	1⅛	..	..	9⅞ H.N.S.	3¾ H.N.S.	2 *9·8-in.*, 6 *4·7-in.*, 10 *2·2-in.*, 4 M.	1	16·5	275	200
c.d.s., t.	Thule* . .	3300	260¾	48	16¾	4740	Stockholm .	1892	1894	..	11¾-8	1⅛	..	..	11½	..	2 *10-in.* (A.), 4 *6-in.*, 5 *2·2-in.*, 8 M.	2	16·2 *t*	250	165
c.d.s., t.	Wasa . .	3670	287	49¼	16½	6000 Y.	Stockholm .	1901	1893	..	7 K.S.	1⅛	..	..	7½ K.S.	5 K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 2 *1·4-in.*, 2 M.	2 sub.	16·5	370	250

The old coast-defence ships John Ericsson, Thordön, and Tirfing, 1500 tons, Lake, 1600 tons, and the armoured gunboats Berserk, Björn, Folke, Gerda, Hildur, Sölve and Ulf, 460 tons. Some of these are being partially modernized.

* Reconstructed or in course of reconstruction.

SWEDEN.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		metric tons.	ft.	ft.	ft.										knots.	tons.	
to.g.b.	Claes Horn	800	222	27	10¼	3600	Stockholm	1899	1900	..	..	..	2 4·7-in., 4 2·2-in.	1 sub.	20·0	..	100
to.g.b.	Claes Uggla	800	232	27¼	8¾	4500 Y.	Stockholm	1900	1901	..	..	..	2 4·7-in., 4 2·2-in.	1	20·5	..	100
tor. ship.	Drott (ex Ran)	630	175¼	26	9¾	960	Stockholm	1877	1878	..	..	..	4 Engström Q.F.	sub. 1	13·0	100	..
g.v.	Edda	640	183¾	27	10¼	960	Carlskrona	1885	1886	..	..	..	1 10·6-in., 1 6-in., 2 1·5-in., 2 M.	..	13·6 t	80	76
corv.	Freja	2000	216	40	19¾	1750	Malmö	1885	1887	..	..	..	4 6-in., 8 4·7-in., 4 1·5-in., 2 2·5-in., 5 M.	..	14·1 t	180	250
to.g.b.	Jacob Bagge	800	222	27	10¼	3970	Malmö	1898	1899	..	..	..	2 4·7-in., 4 2·2-in.	1 sub.	19·5	..	100
"	Örnen					4100	Gothenburg	1896	1897						19·5		
"	Psilander	800	232	27¼	8¾	4500 Y.	Stockholm	1900	1901	..	..	..	2 4·7-in., 4 2·2-in.	1 sub.	20·5 t	..	100
g.v.	Rota	536	171¼	25¼	10¾	780	Stockholm	1878	1879	..	..	..	1 10·6-in., 1 4·7-in., 2 M.	..	13·0	80	72
g.v.	Skäggald	536	171¼	26	9¾	780	Stockholm	1879	1880	..	..	..	1 10·6-in., 1 4·7-in., 2 M.	..	13·2 t	80	72
"	Skagul	536	171½	25½	10¼	780	Stockholm	1878	1879	..	..	..	1 6-in., 1 4·7-in., 2 2·2-in., 2 M.	..	13·1 t	80	72
"	Skuld	536	171¼	25¼	10¾	780	Carlskrona	1879	1880	..	..	..	1 10·6-in., 1 4·7-in., 2 M.	..	13·0	80	72
"	Urd	536	172¼	25½	10½	780	Malmö	1877	1878	..	..	..	1 6-in., 1 4·7-in., 2 2·2-in., 2 M.	..	13·5 t	80	71
"	Verdande	536	171½	25½	10¼	780	Carlskrona	1879	1880	..	..	..	1 10·6-in., 1 4·7-in., 2 M.	..	13·2 t	80	72

Old gun vessel of 500 tons, four gunboats of 190 to 200 tons, and about 130 I.H.P. each, and carrying 1 5-in. B.L.R. and 2 M.; also one vessel of 280 tons and 440 H.P., armed with 4 Q.F. guns—the Svenskund, used as a mining and torpedo-ship and ice-breaker.

TURKEY.—Armoured Ships.

A number of ships have been struck out of these lists owing to information obtained from Constantinople. Of the remainder few have any fighting value.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Secondary.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal	Complement.
		tons.	ft.	ft.	ft.						in.	in.	in.	in.	in.	in.			knots.	tons.	
c.	Assar-i-Shefket	2080	203½	42½	16½	1750	La Seyne	1868	1870	..	6	..	..	..	5	..	1 *9-in.* (A.), 4 *7-in.*, 4 M., 4 l.	..	11·0	375	220
c.b.	Assar-i-Tewfik *	4687	272¼	52½	25	3560	La Seyne	1868	1870	..	8	..	..	..	6	..	2 *9·2-in.*, 6 *6-in.*, 10 *12-pr.*, 12 *6-pr.*	..	13·0	400	..
c.	Avni-Illah	2400	226¼	36	16½	2200	Thames	1869	1871	..	6	1½	..	..	6	..	4 *9-in.* M.L.R. (A.), 4 M., 4 l.	1	12·0	220	225
b.	Azizieh †	6400	292	55¾	25½	3735	Clyde	1864	1865	..	5½	..	5	..	4½	5	2 *9·2-in.* (K.), 8 *8·2-in.*, 6 *3·9-in.*, 7 M., 2 l.	2	13·0	750	600
c.b.	Feth-i-Bulend	2806	236¼	39¼	18	3250	Thames	1869	1870	..	9	5	..	..	9	..	4 *9-in.* M.L.R. (A.), 4 M., 4 l.	1	13·0	300	250
a.g.b.	Feth-el-Islam	335	101¾	24½	6	290	Gironde	1864	1866	..	3	..	..	..	3	..	2 *7-in.* (A.), 2 l.	..	8·0	20	..
c.b.	Hamidieh	6700	292	55¾	24¾	4500	Turkey	1885	1893	..	9	3	5	..	5	..	10 *10·2-in.* (K.), 2 *6·6-in.*, 6 l., 2 M.	2	13·0	600	..
b.	Mahmoudieh †	6400	292	55¾	25½	3735	Thames	1864	1866	..	5½	..	5	..	4½	5	2 *9·2-in.* (K.), 8 *8·2-in.*, 6 *3·9 in.*, 7 M., 2 l.	2	12·0	750	600
c.b.	Messoudieh*	9120	331½	59	25¾	11,000 Nic.	Thames Genoa	1874 1901	1876	..	12	1	12	..	6–9	12	2 *9·2-in.*, 12 *6-in.*, 14 *3-in.*, 10 *6 pr.*, 2 *3-pr.*, 2 l.	..	17·5 *t*	600	..
,,	Muin-i-Zaffer	2400	230	36	16½	2200	Thames	1869	1870	..	6	1½	..	..	6	..	4 *10-in.* M.L.R. (A.), 1 *4·7-in.* (K.), 4 M., 4 l.	1	12·0	220	..
,,	Mukadim-i-Hair	2806	236¼	39¼	18	3000	Turkey	1872	1874	..	9	5	..	..	9	..	4 *10-in.* M.L.R. (A.), 1 *4·7-in.* (K.), 4 M., 4 l.	1	12·0	300	250
,,	Nedjim-i-Schefket	2050	203½	42½	16½	1900	La Seyne	1868	1870	..	6	..	..	..	5	..	1 *9-in*, 4 *7-in.* (A.), 4 M., 4 l.	1	11·0	300	220
b.	Orkanieh †	6400	292	55¾	25½	3735	Clyde	1865	1870	..	5½	..	5	..	4½	5	2 *9·2-in.* (K.), 8 *8·2-in.*, 6 *3·9-in.*, 7 M., 2 l.	2	12·0	750	600
,,	Osmanieh †	6400	292	55¾	25½	3735	Clyde	1864	1869	..	5½	..	5	..	4½	5	2 *9·2-in.* (K.), 8 *8·2-in.*, 6 *3·9-in.*, 7 M., 2 l.	2	12·0	750	600

* The Messoudieh has been reconstructed by Messrs. Ansaldo, receiving new armament and machinery. Nothing appears to have been decided in regard to the Assar-i-Tewfik, which was sent to Kiel.
† It is stated that these vessels are to be reconstructed on the Golden Horn by Messrs. Ansaldo.

TURKEY.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
cr.	Abdul Ham'd / Abdul Medjid *	3250	330	42	16	12,000 Nic.	Elswick / Philadelphia	Bldg.	..	..	3	..	2 6-in., 8 4·7-in., 6 1·8-in., 6 M.	2	24·0	600	..
cr.	Fezibahri	1815	226	35	14	2500	Turkey	Bldg.	..	..	½	..	6 6-in. (K.)	7	17·0	..	..
"	Heibetnuma	1960	226	37	14	2500 ind.	Turkey	1890	1893	..	..	..	3 6·6-in. (K.), 6 4·7-in. 6 Q.F.	2	14·0	..	..
"	Hundavendikiar	4050	279	49¼	21	..	Turkey	Bldg.	..	..	2	..	2 8·9-in. (K.), 6 5·9-in. 4 3·9-in.	5	..	..	300
g.v.	Lutfi-Hamayoun	1313	210	35	14	2800	Turkey	1892	1894	..	..	..	4 6-in. (K.), 6 4·7-in., 6 Q.F.	2	13·0	..	..
to. g.b.	Namet	900	230	31	16½	4500	Gaarden	1890	1891	..	..	¼	2 4-in. (K.), 16 M.	2	19·0	..	111
"	Pelenk-i-deria	840	236¾	31	16½	5000	Gaarden	1890	1891	..	..	¼	2 4-in. (K.), 16 M.	2	20·0	..	111
g.v.	Sedul Bahr	800	173½	26½	11½	160	Turkey	1894	1897	..	2	..	4 4·7-in. (K.), 6 M.	2	12·7	120	..
cr.	Selimieh	4050	279	49¼	21	..	Turkey	Bldg.	..	..	½	..	2 8·2-in. (K.), 6 5·9-in. 4 4 in., 6 M.	..	..	..	300
"	Shadie	1815	226	35	14	2500	Turkey	Bldg.	..	..	..	..	6 5·9-in. (K.)	7	17·0	..	..
to. g.b.	Shahani-deria	450	200	23	9	3000	Turkey	1892	1894	..	..	..	2 4·7-in. (K.), 6 M.	4	22·0	..	..
g.v.	Zuhaf	800	173½	26½	11½	160	Turkey	1894	1896	..	..	..	4 4·7-in. (K.), 6 M.	2	12·7	120	..

* Or Medjidieh.

UNITED STATES.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost. *	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Second-ary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons	
t.	Alabama	11,565	368	72¼	24¾	11,366 *t*	Philadelphia	1898	1901	544,539	16½–4 H.S.	2¾–4	5¼ H S.	12 H.S.	15 H.S.	6 H.S.	4 *13-in.*, 14 *6-in.*, 16 *6-pr.*, 6 *1-pr.*, 4 M., 2 l.	4	17·1 *t*	800/1200	686
c.d.s., t. (2 t.)	Amphitrite	3990	259½	55½	14¾	1600	Wilmington	1883 reblt.	1885	..	9–5	1¾	..	..	11½	..	4 *10-in.*, 2 *4-in.*, 2 *6-pr.*, 2 *3-pr.*, 7 *1-pr.*, 3 M., 1 l.	..	10·5	250	182
c.d.s., t. (1 t.)	Arkansas	3235	252	50	12½	2400 T.	Newport News	1900	1902	197,267	11–5 K.S.	1½	..	..	11 K.S.	..	2 *12-in.*, 4 *4-in.*, 3 *6-pr.*, 6 *1-pr.*, 2 M.	..	11·5	400	131
a. c.	Brooklyn.	9215	400½	64¾	26¼	18,769	Philadelphia	1895	1896	613,583	3 H.S.	6–3	4 H.S.	..	8 H.S.	5½ H.S.	8 *8-in.*, 12 *5-in.*, 12 *6-pr.*, 4 *1-pr.*, 4 M., 2 l.	4	21·9 *t*	900/1461	517
a. c.	California	13,680	502	69¼	24½	23,000 W.T.	S. Francisco	Bldg.	..	756,000	6–3½ K.S.	4	5 K S.	4 K ?	6 K.S.	5 K.S.	4 *8-in.*, 14 *6-in.*, 18 *3-in.*, 12 *3-pr.*, 8 *1-pr.*, 6 M., 2 l.	2	22·0	900/2000	822
a. c.	Charleston	9700	424	66	25½	21,000 Nic.	Newport News	Bldg.	..	..	4	3	4	..	4	..	14 *6-in.*, 18 *14-pr.*, 12 *3-pr.*, 8 *1-pr.*, 4 M.	..	22·0	650/1500	..
a. c.	Colorado.	13,680	502	69¼	..	23,000 Nic.	Philadelphia	1903	..	756,000	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 14 *6-in.*, 18 *3-in.*, 12 *3-pr.*, 8 *1-pr.*, 6 M., 2 l.	2	22·0	900/2000	822
t.	Connecticut	16,000	450	77	26¾	16,500	New York	Bldg.	..	819,300	11½ K.S.	3–4½	8 K S.	..	10 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *7-in.*, 20 *3-in.*, 12 *3-pr.*, 6 *1-pr.*, 8 M., 2 l.	..	18·0	2200	..
c.d.s., t. (1 t.)	Florida	3235	252	50	12½	2400 Nor.	Elizabeth-port	1901	..	190,075	11–5	1½	..	..	11	..	2 *12-in.*, 4 *4-in.*, 3 *6-pr.*, 6 *1-pr.*, 2 M.	..	11·5	400	131
Super-posed turrets.	Georgia	14,948	435	76¼	23¾ †	19,000 Nic.	Bath, Me.	Bldg.	..	..	11–4 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 12 *6-in.*, 12 *3-in.*, 12 *3-pr.*, 8 *1-pr.*, 8 M., 2 l.	2	19·0	900/1900	695
t.	Illinois	11,565	368	72¼	24¾	12,000	Newport News	1898	1902	533,237	16½–4 H S.	2¾–4	5¼ H.S.	12 H.S.	15 H.S.	6 H.S.	4 *13-in.*, 14 *6-in.*, 16 *6-pr.*, 6 *1-pr.*, 4 M., 2 l.	4	17·45 *t*	800/1200	686
b.	Indiana	10,288	348	69¼	27¼	9,738	Philadelphia	1893	1894	620,569	18 H.S.	2¾	5 H S.	17 H.S.	17 H.S.	10 H.S.	4 *13-in.*, 8 *8-in.*, 4 *6-in.*, 20 *6-pr.*, 4 *1-pr.*, 2 l.	2	15·5 *t*	400/1597	497
b.	Iowa	11,340	360	72¼	26¾	12,105	Philadelphia	1896	1898	618,514	14 H.S.	2¾	5 H S.	12 H.S.	15 H.S.	8–6 H S.	4 *12-in.*, 8 *8-in.*, 6 *4-in.*, 20 *6-pr.*, 4 *1-pr.*, 4 M., 2 l.	4	17·8 *t*	625/1795	510

* The sums given in this column are exclusive of the cost of armour and armament, according to the system of making appropriations in the estimates. † Mean draught.

UNITED STATES.—Armoured Ships—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-power.	Where Built.	Date of Launch.	Date of Completion.	Cost. *	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Second-ary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
ram	Katahdin	2155	250¾	43½	16	5,068	Bath, Me.	1893	1895	191,102	6–3	2–6	..	..	18 con. tr.	..	4 *6-pr.*	..	16·1 *t*	175 / 192	97
super-posed turrets	Kearsarge Kentucky	11,540	368	72¼	25¾	11,954 12,318	Newport News	1898	1900	462,345 each	16½–4 H.S.	2¾–5	5½ H.S.	..	15 H.S.	9 H.S.	4 *13-in.*, 4 *8-in.*, 14 *5-in.*, 20 *6-pr.*, 8 *1-pr.*, 4 M., 2 l.	4	16·8 *t*	410 / 1591	586 589
t.	Louisiana	16,000	450	77	26¾	20,000 W.T.	Newport News	Bldg.	..	819,300	8–11 K.S.	3–4½	..	..	10 K.S.	7 K.S.	4 *12-in.*, 8 *8-in.*, 12 *7-in.*, 20 *3-in.*, 12 *3-pr.*, 6 *1-pr.*, 8 M., 2 L.	..	18·0	2200	..
t.	Maine	12,300	388	72¼	25½	16,000 Nic.	Philadelphia	1901	..	592,828	11–4 K.S.	2¾–4	6 K.S.	10 K.S.	12 K.S.	6 K.S.	4 *12-in.*, 16 *6-in.*, 6 *3-in.*, 8 *6-pr.*, 6 *1-pr.*, 2 M., 2 l.	2 sub.	18·0	1000 / 2000	551
a.c.	Maryland	13,680	502	69½	24½	23,000 W.T.	Newport News	Bldg.	..	756,400	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 14 *6-in.*, 18 *3-in.*, 12 *3-pr.*, 8 *1-pr.*, 6 M., 2 l.	2 sub.	22·0	900 / 2000	822
b.	Massachusetts	10,288	348	69¼	27¼	10,415	Philadelphia	1893	1896	620,569	18 H.S.	2¾	5 H.S.	17 H.S.	17 H.S.	10–5 H.S.	4 *13-in.*, 8 *8-in.*, 4 *6-in.*, 20 *6-pr.*, 4 *1-pr.*, 2 M.	2	16·2 *t*	400 / 1597	495
c.d.s.,t. (2 t.)	Miantonomoh	4005	259½	55¼	15	1,426	Chester	1876 reblt.	1877	..	7–4	1¾	..	..	11½	..	4 *10-in.*, 2 *6-pr.*, 2 *3-pr.*, 6 *1-pr.*, 1 M, 1 l.	..	10·5	250	149
a.c.	Milwaukee	9700	424	66	25½	21,000 W.T.	S. Francisco	Bldg.	..	..	4	3	4	..	4	..	14 *6-in.*, 18 *14-pr.*, 12 *3-pr.*, 8 *1-pr.*, 4 M.	..	22·0	650 / 1500	
t.	Missouri	12,230	388	72¼	25½	16,000 T.	Newport News	1901	..	592,828	12–4 K.S.	2¾–4	6 K.S.	10 K.S.	12 K.S.	6 K.S.	4 *12-in.*, 16 *6-in.*, 6 *3-in.*, 8 *6-pr.*, 6 *1-pr.*, 2 M., 2 l.	2 sub.	18·0	1000 / 2000	551
c.d.s.,t. (2 t.)	Monadnock	3990	259½	55½	14½	3,000	Vallejo, Cal.	1883 reblt.	1885	..	5–9	1¾	..	..	11½	..	4 *10-in.*, 2 *4-in.*, 2 *6-pr.*, 2 *3-pr.*, 2 *1·4-in.*, 2 *1-pr.*, 2 M., 1 l.	..	12·0	250 / 3[illegible]6	213
c.d.s.,t.	Monterey	4084	256	59	15¼	5244	S. Francisco	1891	1893	345,731	13–6	3	..	..	13	..	2 *12-in.*, 2 *10-in.*, 6 *6-pr.*, 4 *1-pr.*, 2 M., 1 l.	..	13·6 *t*	200 / 233	218
Super-posed turrets.	Nebraska	14,948	435	76¼	23¾ †	19,000 W.T.	Seattle	Bldg.	..	..	11–4 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 12 *6-in.*, 12 *3-in.*, 12 *3-pr.*, 8 *1-pr.*, 8 M., 2 l.	2 sub.	19·0	900 / 1900	695
c.d.s.,t. (1 t.)	Nevada	3235	252	50	12½	2,400 Nic.	Bath, Me.	1900	1902	197,267	11–5	1½	..	..	11	..	2 *12-in.*, 4 *4-in.*, 3 *6-pr.*, 6 *1-pr.*, 2 M.	..	12·5 *t*	400	13[illegible]
Super-posed turrets.	New Jersey	14,948	435	76¼	23¾ †	19,000 W.T.	Quincy, Mass.	Bldg.	..	..	11–4 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 12 *6-in.*, 12 *3-in.*, 12 *3-pr.*, 8 *1-pr.*, 8 M., 2 l.	2 sub.	19·0	900 / 1900	
a.c.	New York	8200	380½	64¾	26¾	17,401	Philadelphia	1891	1893	613,377	4	6–3	..	..	10	5–½4	6 *8-in.*, 12 *4-in.*, 8 *6-pr.*, 2 *1-pr.*, 2 M.	2	21·0 *t*	750 / 1290	
t.	Ohio	12,440	388	72¼	25½	16,000 T.	S. Francisco	1901	..	595,705	11–4 K.S.	3–4	6 K.S.	10 K.S.	12 K.S.	6 K.S.	4 *12-in.*, 16 *6-in.*, 6 *3-in.*, 8 *6-pr.*, 6 *1-pr.*, 2 M., 2 l.	2 sub.	18·0	1000 / 2000	521
b.	Oregon	10,288	348	69¼	27¼	11,111	S. Francisco	1893	1896	653,447	18 H.S.	2¾	5 H.S.	17 H.S.	17 H.S.	10–5 H.S.	4 *13-in.*, 8 *8-in.*, 4 *6-in.*, 20 *6-pr.*, 4 *1-pr.*, 2 M., 2 l.	2	16·8 *t*	400 / 1594	494
a.c.	Pennsylvania	13,680	502	69½	24½	23,000 Nic.	Philadelphia	Bldg.	..	..	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 14 *6-in.*, 18 *3-in.*, 12 *3-pr.*, 8 *1-pr.*, 6 M., 2 l.	2 sub.	22·0	900 / 2000	822
c.d.s.,t. (2 t.)	Puritan	6060	290¼	60	18½	3,700	Chester	1882 reblt.	1884	..	14–6	2	..	..	14	..	4 *12-in.*, 6 *4-in.*, 6 *6-pr.*, 2 *1·4-in.*, 2 *1-pr.*, 1 l.	..	12·4 *t*	307	230
Super-posed turrets.	Rhode Island	14,948	435	76¼	23¾ †	19,000 W.T.	Quincy, Mass.	Bldg.	..	..	11–4 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 12 *6-in.*, 12 *3-in.*, 12 *3-pr.*, 8 *1-pr.*, 8 M., 2 l.	2 sub.	19·0	900 / 1900	695
a.c.	St. Louis	9700	424	66	25½	21,000 W.T.	Philadelphia (Neafie)	Bldg.	..	..	4 K.S.	3	4–3	..	4 K.S.	..	14 *6-in.*, 18 *14-pr.*, 12 *3-pr.*, 8 *1-pr.*, 4 M.	..	22·0	650 / 1500	
a.c.	South Dakota	13,680	502	69½	24½	23,000 W.T.	S. Francisco	Bldg.	..	..	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 14 *6-in.*, 18 *3-in.*, 12 *3-pr.*, 8 *1-pr.*, 6 M., 2 l.	2 sub.	22·0	900 / 2000	822
a. c.	Tennessee	14,500	502	72¾	25	25,000 B. & W.	Philadelphia	Bldg.	..	970,630‡	6–3 K.S.	4–1½	5 K.S.	5 K.S.	9 K.S.	5 K.S.	4 *10-in.*, 16 *6-in.*, 22 *3-in.*, 12 *3-pr.*, 4 *1-pr.*, 6 M., 2 l.	..	22·0	900 / 2000	845
c.d.s.,t. (2 t.)	Terror	3990	259½	55½	15¼	1,600	Philadelphia	1883 reblt.	1885	..	7–4	1¾	..	..	11½	..	4 *10-in.*, 2 *6-pr.*, 2 *3-pr.*, 2 *1·4-in.*, 1 l.	..	10·5	250 / 285	443
t.	Texas	6315	301¼	64	25¼	8,610	Norfolk	1892	1895	513,716	12	2	..	12	12	..	2 *12-in.*, 6 *6-in.*, 12 *6-pr.*, 10 *1-pr.*, 2 M., 1 l.	2	17·8 *t*	500 / 850	177
Super-posed turrets.	Virginia	14,948	435	76¼	23¾ †	19,000 W.T.	Newport News	Bldg.	..	..	11–8 K.S.	3	6 K.S.	6 K.S.	11 K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 12 *6-in.*, 12 *3-in.*, 12 *3-pr.*, 8 *1-pr.*, 8 M., 2 l.	2 sub.	19·0	900 / 1900	695
a.c.	Washington	14,500	502	72¾	25	25,000 B. & W.	Philadelphia	Bldg.	..	970,630‡	6–3 K.S.	4–1½	5 K.S.	5 K.S.	9 K.S.	5 K.S.	4 *10-in.*, 16 *6-in.*, 22 *3-in.*, 12 *3-pr.*, 4 *1-pr.*, 6 M., 2 l.	..	..	900 / 2000	845
a.c.	West Virginia	13,680	502	69½	24½	23,000 W.T.	Newport News	Bldg.	..	..	6–3½ K.S.	4	5 K.S.	12 H.S.	6 K.S.	5 K.S.	4 *8-in.*, 14 *6-in.*, 18 *3-in.*, 12 *3-pr.*, 8 *1-pr.*, 6 M., 2 l.	2 sub.	22·0	900 / 2000	822
t.	Wisconsin	11,565	368	72¼	25½	10,000	S. Francisco	1898	1902	549,666	16½–4 H.S.	3·4	5½ H.S.	..	15 H.S.	6 H.S.	4 *13-in.*, 14 *6-in.*, 16 *6-pr.*, 4 *1-pr.*, 4 M., 2 l.	4	17·1 *t*	800 / 1200	531
c.d.s.,t. (1 t.)	Wyoming	3235	252	50	12½	2,400 B. & W.	S. Francisco	1900	1903	200,350	11–5	1½	..	..	11	..	2 *12-in.*, 4 *4-in.*, 3 *6-pr.*, 6 *1-pr.*, 2 M.	..	11·5	400	131

* See note on previous page. † Mean draught. ‡ Exclusive of armament.

Three battleships (16,000 tons), the Vermont, Kansas and Minnesota, and two battleships (13,000 tons), the Mississippi and Idaho, are in the new programme, to cost respectively in the two classes, exclusive of armour and armament, £906,606 and £719,613.

UNITED STATES.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost. ‡	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
cr.	Albany (ex Abreu) shd.	3769	345	43¾	20	7400	Elswick	1899	1900	247,611	3	3–1½ shields	6 6-in., 4 5-in., 10 6-pr., 4 1-pr., 4 M., 2 l.	3	20·0	512/754	260
g.b.	Annapolis	1000	168	36	12½	1227 B.&W.	Elizabeth Pt.	1896	1893	46,789	..	..	6 4-in., 4 6-pr., 2 1-pr., 1 M.	..	13·1 t	100/225	135
cr.	Atlanta	3000	271¼	42¼	21	4030 B.&W.	Chester	1884	1886	126,785	1½	..	2 8-in., 6 6-in., 6 6-pr., 4 1-pr., 2 M., 1 l.	..	15·6 t	490	278
cr.	Baltimore	4413	327½	48½	24	10,064	Philadelphia	1888	1890	272,270	4–2½	4½ shield	4 8-in., 6 6-in., 4 6-pr., 2 3-pr., 2 1-pr., 6 M., 1 l.	5	20·1 t	400/1143	386
g.v.	Bancroft	839	187½	32	13	1213	Elizabeth Pt.	1892	1893	51,371	½	..	4 4-in., 8 3-pr., 1 1-pr., 1 M.	1	14·37 t	100/136	195
g.v.	Bennington	1710	230	36	16½	3436	Chester	1890	1891	100,894	½	..	6 6-in., 2 6-pr., 2 3-pr., 2 1-pr., 2 M.	..	17·5 t	200/403	195
cr.	Boston	3000	271¼	42¼	21	4300	Chester	1884	1886	127,196	1½	..	2 8-in., 6 6-in., 2 6-pr., 2 3-pr., 2 1-pr., 2 1·8-in., 2 1·4-in., 2 M., 1 l.	..	15·6 t	495	278
g.v.	Castine	1177	204	32	14¼	2199	Bath, Me.	1892	1893	65,450	½	..	8 4-in., 4 6-pr., 2 1-pr., 1 M., 1 l.	..	16·0	125/292	151
cr.	Chattanooga shd.	3200	292	44	16¾	4700 B.&W.	Elizabeth Port	1903	..	212,325	2	..	10 5-in., 8 6-pr., 2 1-pr., 4 M., 1 l.	..	16·5	470/700	293
cr.	Cleveland shd.							1901									
cr.	Chicago	4500	325	48¼	22½	9000 C. & B.&W.	Chester	1885	1887	182,677	1½	4 shield	4 8-in., 14 5-in., 7 6-pr., 2 1-pr., 2 M., 1 l.	..	18·0	831	409
cr.	Cincinnati	3213	300	42	20¼	10,000	Brooklyn	1892	1894	226,055	2½	4	11 5-in., 8 6-pr., 2 1-pr., 2 M., 1 l.	2	19·0	350/468	314
cr.	Columbia	7375	412	58¼	25½	18,509	Philadelphia	1892	1893	559,950	4–2½	4 shield	1 8-in., 2 6-in., 8 4-in., 12 6-pr., 2 1-pr., 2 M., 1 l.	4	22·8 t	750/1670	477
g.v.	Concord	1710	230	36	16½	3405	Chester	1890	1891	100,894	½	..	6 6-in., 2 6-pr., 2 3-pr., 2 1·4-in., 2 M., 1 l.	..	16·8 t	200/401	194
cr.	Detroit	2089	257	37	16¾	5227	Baltimore	1891	1893	125,960	½	..	10 5-in., 6 6-pr., 2 1-pr., 2 M., 1 l.	2	18·71 t	200	256
cr. cr.	Denver / Des Moines shd.	3200	292	44	16¾	4700 W.T.	Philadelphia / Quincy, Mass.	1902	..	212,325	2	..	10 5-in., 8 6-pr., 2 1-pr., 4 M., 1 l.	..	16·5	470/700	293
g.v.	Dolphin	1486	240	32	17	2253	Chester	1884	1886	64,728	..	..	2 4-in., 2 14-pr., 2 6-pr., 2 3-pr., 2 M.	..	15·5 t	173	117
cr.	Don Juan de Austria*	1130	210	32	13	1600	Cartagena	1889	1892	..	..	..	4 5-in., 4 6-pr., 4 M.†	3	14.0	210	130
cr.	Galveston shd.	3200	292	44	16¾	4700 W.T.	Richmond, Va.	1902	..	212,325	2	..	10 5-in., 8 6-pr., 2 1-pr., 4 M., 1 l.	..	16·5	470/700	293
g.v.	General Alava	1390	212	28¼	16	770	..	..	..	..	..	..	4 M.	..	10·5	..	..
g.v.	Helena	1397	250¾	40	10	1988	Newport News	1896	1897	57,536	½	2½	8 4-in., 4 6-pr., 4 1-pr., 2 M., 1 l.	..	15·5 t	100/300	256
g.v. g.v.	Isla de Cuba* / Isla de Luzon*	1125	192	30	12¼	1000	Elswick	1887	1888	..	2½	..	4 4-in., 4 6-pr., 4 M.†	3	14·0	160	160
g.v.	Machias	1177	204	32	14¼	2046	Bath, Me.	1891	1893	65,450	½	..	8 4-in., 4 6-pr., 2 1-pr., 1 M., 1 l.	..	15·46 t	125/292	151
cr.	Marblehead	2089	257	37	16¾	Nor. 5451	Boston	1892	1893	138,498	½	..	10 5-in., 6 6-pr., 2 1-pr., 2 M., 1 l.	2	18·9 t	200/340	248
d.v.	Marquès del Duero*	500	157½	25½	8½	550	La Seyne	1875	1877	..	..	..	.. ..	..	10·0	90	98
g.b.	Marietta	1000	174	34	13½	1054 B.&W.	S. Francisco.	1896	1897	45,823	..	..	6 4-in., 4 6-pr., 2 1-pr., 1 M., 1 l.	..	13·2 t	100/239	140
cr.	Minneapolis	7375	412	58¼	25½	20,862	Philadelphia	1893	1894	552,754	4–2½	4 shield	1 8-in., 2 6-in., 8 4-in., 12 6-pr., 2 1-pr., 2 M., 1 l.	4	23·0 t	750/1200	477
cr.	Montgomery	2089	257	37	17	5580	Baltimore	1891	1893	125,860	½	..	10 5-in., 6 6-pr., 2 1-pr., 2 M., 1 l.	2	18·8 t	200/340	257
g.v.	Nashville	1371	220	38	12	2536 Y.	Newport News	1895	1897	57,536	½	..	8 4-in., 4 6-pr., 2 1-pr., 2 M., 1 l.	1	16·7 t	150/400	176
cr.	Newark	4098	311½	49¼	22½	8869	Philadelphia	1890	1891	256,437	3–2	2 shield	12 6-in., 8 6-pr., 4 1-pr., 2 M., 1 l.	..	19·0	400/809	384
g.b.*	Newport	1100	168	36	13	1008	Bath, Me.	1896	1897	..	..	..	6 4-in., 4 6-pr., 2 1-pr., 1 M.	..	12·2 t	100/230	147
cr.	New Orleans shd.	3769	346	43¾	19¾	7500	Elswick	1896	1898	293,684	..	3–1½ shields	6 6-in., 4 5-in., 10 6-pr., 4 3-pr., 4 M., 2 l.	..	20·0	700/800	
g.b.	Newport	1000	168	36	12½	1008	Bath, Me.	1896	1897	47,406	..	..	6 4-in., 4 6-pr. 2 1-pr., 1 M.	..	12·3 t	100/239	135
cr.	Olympia	5870	340	53	24¾	17,313	S. Francisco.	1892	1894	369,054	4½	4–2½	4 8-in., 10 5-in., 14 6-pr., 7 1-pr., 2 M., 1 l.	6	21·69 t	400/1169	450

* Captured at Manila after the battle of May 1, 1898. The following gunboats were captured during the war with Spain, or subsequently purchased: Albay, Alvarado, Arayat, Barcelo, Basco, Belusan, Calamaines, Callao, El Cano, Guardoqui, Leyte, Manileño, Mariveles, Mindoro, Pampanga, Panay, Paragua, Piscataqua, Quiros, Samar, Sandoval, Urdañeta, Villalobos.
† New armament of the captured cruisers.
‡ Prices exclusive of armament.

UNITED STATES.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Normal Coal Supply.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
g.v.	Petrel	892	176¼	31	13½	1095	Baltimore	1888	1889	50,755	..	..	4 *6-in.*, 2 *3-pr.*, 2 *1-pr.*, 2 *1·4-in.*, 2 M.	..	11·8 *t*	100/200	122
cr.	Philadelphia	4324	327½	48½	23½	8815	Philadelphia	1889	1890	277,405	..	4–2½ Shields	12 *6-in.*, 4 *6-pr.*, 4 *1-pr.*, 2 M., 1 l.	..	19·68 *t*	400/1085	384
g.b.	Princeton	1000	168	36	12½	800	Camden	1897	1899	47,262	..	..	6 *4-in.*, 4 *6-pr.*, 2 *1-pr.*, 1 M.	..	12·0	100/238	135
cr.	Raleigh	3213	300	42	20¼	10,000 B.&W.	Norfolk	1892	1893	226,055	2½	4	11 *5-in.*, 8 *6-pr.*, 4 *1-pr.*, 2 M., 1 l.	2	9·0	350/460	313
cr.	Reina Mercedes *	3090	279¾	43¼	19½	3700	Ferrol	1887	1889	..	..	..	6 *6·2-in.*, 2 *2·7-in.*, 3 *2·2-in.*	5	17·5	600	370
cr.	San Francisco	4098	310	49¼	22¼	9913	S. Francisco	1889	1891	293,435	3–2	2 Shields	12 *6-in.*, 4 *6-pr.*, 4 *3-pr.*, 2 *1-pr.*, 6 M., 1 l.	4	19·5	350/628	383
cr.	Tacoma shd.	3200	292	44	16¾	4700 W. T.	S. Francisco	Bldg.	..	212,325	..	2 Shields	10 *5-in.*, 8 *6-pr.*, 2 *1-pr.*, 4 M., 1 l.	..	16·5	470/700	293
g.v.	Topeka	1814	250	35	..	1095	Kiel	1881	1882	..	..	..	6 *4-in.*, 6 *3-pr.*, 2 *1-pr.*, 1 M.	..	16·0	273/410	167
cr.	Vesuvius (Dynamite Gunboat)	929	252¼	26½	11¼	3795	Philadelphia	1888	1899	71,963	..	..	3 *15-in.* dynamite guns, 3 *3-pr.*, 2 M.	..	21·4 *t*	152	69
g.v.	Vicksburg	1000	168	36	12½	1118	Bath, Me.	1896	1898	47,406	..	..	6 *4-in.*, 4 *6-pr.*, 2 *1-pr.*, 1 M.	..	12·7 *t*	100/239	135
g.v.	Wheeling	1000	174	34	12½	1081	S. Francisco	1897	1898	65,540	..	..	6 *4-in.*, 4 *6-pr.*, 2 *1-pr.*, 1 M., 1 l.	..	12·9 *t*	120/226	140
g.v.	Wilmington	1397	250¾	40	10	1894	Newport News	1895	1897	57,536	1	2¼	8 *4-in.*, 4 *6-pr.*, 4 *1-pr.*, 4 M., 1 l.	..	15·0 *t*	100/300	175
g.v.	Yorktown	1710	230	36	16½	3392	Philadelphia	1888	1890	93,496	..	..	6 *6-in.*, 2 *6-pr.*, 2 *3-pr.*, 4 *1-pr.*, 2 M., 1 l.	2	16·1 *t*	200/380	195

* Sunk at the mouth of Santiago Harbour, July 5, 1898, and refloated.

Also the sailing training ship Chesapeake (1175 tons), built at Bath, Me., and launched 1899.
Two 1000-ton gun vessels, Dubuque and Paducah, are to be built; also two steel training ships and a wooden brig.

Enrolled Auxiliary Cruisers of the United States Navy.

Class.	NAME.	Gross Tonnage.	Length.	Beam.	Depth.	Indicated Horse-Power.	Where Built.	When Built.	Owners.	Armament, all Q.F.	Speed.
			ft.	ft.	ft.						
1st	St. Louis	11,629	535½	63	26¾	18,000	Philadelphia	1895	International Navigation Co.	8 5·5-in., 4 6-pr., 4 M.	22·2
1st	St. Paul	11,629	535½	63	26¾	18,000	"	1895	"	8 5·5-in., 4 6-pr., 4 M.	22·5
1st	Paris.	10,794	517	63¼	22	20,000	Clydebank, Scotland	1889	"	12 5·5-in., 6 6-pr., 6 M.	20·7
1st	New York	10,802	517	63¼	22	20,000	"	1888	"	12 5·5-in., 6 6-pr., 6 M.	20·6

Converted Merchant Vessels Retained.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Cost.	Armament. Guns.	Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.				£			knots.	tons.	
cr.	Buffalo	6888	380½	48	22	3600	Newport News	1893	117,949	2 5-in., 4 4-in., 6 6-pr., 2 M.	..	14·5	100	297
cr.	Dixie	6114	389¼	48	19¾	1371	Newport News	1893	117,949	10 6-in., 6 6-pr., 2 M.	..	16·0	1371	181
cr.	Panther	4260	310	40	18¼	..	Philadelphia	1889	77,055	6 5-in., 2 4-in., 6 3-pr., 1 M., 1 l.	..	13·0	475	198
cr.	Prairie	6872	390½	46¾	22	3800	Philadelphia	1890	117,949	10 6-in., 6 6-pr., 2 M.	..	14·5	1000	295
cr.	Yankee	6888	380½	48	22	3800	Newport News	1892	117,949	10 5-in., 6 6-pr., 2 M.	..	14·5	1000	282
cr.	Yosemite	6179	389¼	48	20¼	3800	Newport News	1892	117,949	10 6-in., 6 6-pr., 2 M.	..	16·0	1371	285
cr.	Mayflower (yacht)	2690	275	36	17¼	4700	Clydebank	1896	88,359	2 5-in., 12 6-pr., 2 M.	..	16·8	584	160

There are also 22 other converted yachts, varying in displacement from 82 tons to 975 tons.
Many other vessels are on the auxiliary list, but are of low speed.

SHIPS BELONGING TO POWERS WHOSE NAVIES ARE OF LESSER IMPORTANCE.

Belgium.—Several steam vessels, between 419 and 684 tons, principally employed as packets, under the orders of the Government. The Ville d'Anvers, 414 tons, for fishery protection.

Bulgaria.—Eleven steamers of small size, of which one is used as the Prince's yacht. Two armoured gunboats, for the defence of the Danube, completing at Leghorn. Other ships are to be laid down. The Nadiezda, a despatch vessel (715 tons) of the French Casabianca type; length, 219 ft. 6 in.; beam, 27 ft. 6 in.; draught, 12 ft. 6 in.; launched at Bordeaux in 1898, steamed at 18·85 knots at her trials; engines, 2600 I.H.P.; Lagrafel-d'Allest boilers; armament, 2 3·9-in., 3 1·8-in. Q.F., and 2 torpedo tubes.

Colombia.—The cruiser Almirante Lezo (*ex* El Baschir), of 1200 tons displacement, 2500 H.P., 18 knots speed, built in 1892, bought from Morocco, 1902. Two gunboats, Namuna and Atalanta, have also been bought. Two river gunboats, General Nerino and Esperanza, 400 tons.

Ecuador.—The two old (1886) French despatch vessels, Papin and Inconstant (891 tons), built of wood and iron, have been bought. The Republic also possesses a torpedo boat and two steam transport vessels.

Egypt.—The Nile stern-wheel gunboats Sultan, Sheikh and Melik, 140 tons, Fateh and Naseh, 128 tons; also the Abu Klea, Hafir, Metemmeh and Tamai. Some steam vessels on the coast.

Hayti.—Steel gun vessel, Crête à Pierrot, 940 tons, sunk by the German gunboat Panther, as a punitive measure, Sept. 7, 1902. See Chap. II. Steel gunboat—Capois la Mort, 260 tons, 1 3·9-in., and 4 1-pr. Q.F. Iron corvette—Dessalines, 1200 tons, armed with 1 3·9-in. Q.F., 2 3·9-in. B.L., 2 l., 2 M. Two iron or steel sloops—St. Michael and 1804, of from 500 to 900 tons, of 12 to 14 knots speed, and armed with 1 large and 4 to 8 small guns. Gun vessel, 22nd of December, of 900 tons, 9 knots speed, armed with 4 40-pr. Armstrongs.

Mexico.—The Zaragoza, built of steel, 1200 tons, 1300 H.P., 15 knots speed, and armed with 4 4·7-in. guns and 4 rapid-firing guns. Two gun vessels—Democrata and Mexico, of 450 tons and 11 knots speed, armed with 2 6½-inch muzzle-loaders and 2 small guns. Two small gunboats of 10 knots speed. Five torpedo boats. Two gun-vessels, Tampico and El Cruz, launched at Elizabethport, New Jersey, September, 1902, 980 tons, 201 ft. long, 33 ft. beam, 10 ft. draught; 4 4-in. Q.F., 6 6-pr.; bow torpedo tube; W.T. boilers, 2400 I.H.P., for 16 knots; fitted to serve as transport for 200 troops.

Persia.—Despatch vessel—the Persepolis—of 1200 tons and 10 knots speed. She is armed with 5 small breech-loading guns.

Peru.—Eclaireur, cruiser, 1769 tons, launched 1877, and partially reconstructed. Bought from France. Lima, built in 1881, of 1700 tons displacement, 1800 horse-power, and 16 knots speed; armed with two 6-in. B.L.R. guns. Screw steamer Santa Rosa, of about 400 tons.

Roumania.—Elizabeta, protected cruiser (deck 3 in. thick), built in 1887 at Elswick; 230 ft. long, 32 ft. 10 in. beam, 1320 tons, 3000 I.H.P.; 4 5·9-in. B.L.R., 4 Q.F., 2 M., 4 torpedo tubes. Composite gunboat Mircea, 360 tons; Grivitza, 110 tons. Two gunboats of 45 tons, and 3 first-class torpedo boats, these forming the sea division. For the Danube, the gunboats Fulgurul, Oltul, Siretul, Bistritza, 90 to 100 tons, the *torpilleur de barrage* Alexandru cel Bun (104 tons), 5 sloops, 2 small torpedo boats, and the screw steamer Romania, 240 tons, repaired 1890. The shipbuilding programme contemplates the building of 8 monitors of 500 tons, 12 torpedo-boats and 8 vedettes for the Danube, and 6 coast-defence vessels of 3500 tons, 4 destroyers of 300 tons, and 12 torpedo-boats for the Black Sea.

Santo Domingo.—The Independencia, built in England 1894, 170 ft. long, 25 ft. broad, displacement 322 tons, and armed with seven Hotchkiss quick-firing guns. Restauracion, steel gunvessel, 1000 tons, launched at Glasgow in 1896. The 14-knot cruiser Presidente has been reconstructed, and carries seven guns.

Sarawak.—Two gunboats, of 175 and 118 tons respectively, of low speed, each armed with two guns.

Siam.—Two corvettes (800 tons, 8 guns); six gunboats. One deck-protected cruiser, the Maha Chakrkri, 290 ft. long, 39 ft. 4 in. broad, of 2500 tons displacement and 17 to 18 knots speed; armament, four 4·7-in. quick-firing guns, and ten 6-pr. quick-firing guns. Makut-Rajakamar, 650 tons. The gunboats Bali and Sugrib, 600 tons, one 4·7-in. Q.F., five 2·2 in., four 1·4 in., 12 knots, launched 1901. Three modern despatch vessels 100 to 250 tons.

Uruguay.—Gunboats: General Artigas, 274 tons, 12½ knots speed, 2 4·7-in. (Krupp), 2 M.; General Rivera, 300 tons, 12 knots speed, armed with 1 5·9-in. and 1 2·3-in. gun; and the General Saurez.

Venezuela.—By the action of the British and German naval forces at La Guaira and Maracaibo in December, 1902, the Venezuelan Navy was almost destroyed. The General Crespo, Tatumo, Margarita and others were sunk, and two vessels undergoing repairs were broken up. By later agreement the Restaurador and some other vessels captured were restored to Venezuela. They have little or no value.

BRITISH AND FOREIGN TORPEDO-BOAT FLOTILLAS.

Great Britain and Dependencies.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Mean Speed on Trial, or expected.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
Great Britain.			Feet	Feet.	Feet.		Tons.		Knots.				Tons.
TORPEDO-BOAT DESTROYERS													
†Ardent	Chiswick	1894	201·6	19	7·3	2	247	4,500	27·97	1–12 pr. 5–6 prs.	2	45	60
Banshee	Birkenhead	1894	210	19·5	..	2	290	4,400	27·97	1–12 pr. 5–6 prs.	2	50	
†Boxer	Chiswick	1894	201·6	19	7·3	2	247	4,500	27·17	1–12 pr. 5–6 prs.	2	45	60
†Bruiser	Chiswick	1895	201·6	19	7·3	2	247	4,500	27·97	1–12 pr. 5–6 prs.	2	45	60
*Charger	Poplar	1894	190	18·5	5·25	2	250	3,100	27·98	1–12 pr. 5–6 prs.	2	45	60
Conflict	East Cowes	1894	205·6	20	..	2	270	4,370	27·21	1–12 pr. 5–6 prs.	2	50	60
Contest	Birkenhead	1894	210	19·5	..	2	290	4,400	27·4	1–12 pr. 5–6 prs.	2	50	60
†Daring	Chiswick	1893	185	19	7	2	237	4,300	27·70	1–12 pr. 3–6 prs.	3	45	50
*Dasher	Poplar	1895	190	18·5	5·25	2	250	3,182	26·21	1–12 pr. 5–6 prs.	2	45	60
†Decoy	Chiswick	1894	185	19	7	2	237	4,300	27·76	1–12 pr. 3–6 prs.	3	45	50
Dragon	Birkenhead	1894	210	19·5	..	2	290	4,500	27·14	1–12 pr. 5–6 prs.	2	50	
Ferret	Birkenhead	1893	194	19·25	5	2	280	4,810	27·62	1–12 pr. 3–6 prs.	3	50	70
Fervent	Paisley	1895	200	19	7·8	2	270	3,800	[27]	1–12 pr. 5–6 prs.	2	50	70
†Handy	Fairfield	1895	200	19	7·8	2	260	3,800	27·04	1–12 pr. 5–6 prs.	2	50	70
Hardy	Sunderland	1895	196	19	5	2	245	4,200	26·8	1–12 pr. 5–6 prs.	2	50	70
†Hart	Fairfield	1895	185	19	7	2	260	4,010	27·07	1–12 pr. 5–6 prs.	2	50	70
*Hasty	Poplar	1894	190	18·5	5·25	2	250	3,250	26·08	1–12 pr. 5–6 prs.	2	45	60
Haughty	Sunderland	1895	196	19	5	2	265	4,000	27·1	1–12 pr. 5–6 prs.	2	50	60
Havock	Poplar	1893	180	18·5	5·25	2	240	3,500	26·77	1–12 pr. 3–6 prs.	3	43	57
Hornet	Poplar	1893	180	18·5	5·25	2	240	4,000	27·31	1–12 pr. 3–6 prs.	3	43	57
†Hunter	Fairfield	1895	200	19·7	6·5	2	260	4,000	27·2	1–12 pr. 5–6 prs.	2	45	60
Janus	Jarrow	1895	200	19·7	6·5	2	252	3,789	27·8	1–12 pr. 5–6 prs.	2	50	60
Lightning	Jarrow	1895	200	19·7	6·5	2	252	4,007	27·94	1–12 pr. 5–6 prs.	2	50	60
Lynx	Birkenhead	1894	194	19·25	5	2	280	4,000	27·00	1–12 pr. 3–6 prs.	3	50	70
Opossum	Hebburn	1895	200	19	5·2	2	290	4,052	28·24	1–12 pr. 5–6 prs.	2	50	60
Porcupine	Jarrow	1895	200	19·7	6·5	2	288	3,866	27·91	1–12 pr. 5–6 prs.	2	50	60
Ranger	Hebburn	1895	200	19	5·2	2	264	3,900	27·13	1–12 pr. 5–6 prs.	2	50	60
Rocket	Clydebank	1894	205·6	19·5	5·25	2	280	4,200	27·37	1–12 pr. 5–6 prs.	2	50	60
Salmon	Hull	1895	200	19·5	5·4	2	264	3,580	27·60	1–12 pr 5–6 prs.	2	50	60
Shark	Clydebank	1894	205·6	19·5	5·25	2	280	4,250	27·59	1–12 pr 5 6 prs.	2	50	60
Skate	Barrow	1895	195	20·5	..	2	265	4,100	27·10	1–12 pr. 5–6 prs.	2	50	60
Snapper	Hull	1895	200	19·5	5·5	2	270	4,500	27·9	1–12 pr. 5–6 prs.	2	50	60
Spitfire	Elswick	1895	200	19	5·3	2	300	3,780	27·5	1–12 pr. 5–6 prs.	2	45	60
Starfish	Barrow	1894	195	20·5	..	2	265	4,000	27·97	1–12 pr. 5–6 prs.	2	45	60
Sturgeon	Barrow	1894	195	20·5	..	2	265	4,010	27·16	1–12 pr. 5–6 prs.	2	45	60
Sunfish	Hebburn	1895	200	19	5·2	2	290	4,292	27·62	1–12 pr. 5–6 prs.	2	50	60
Surly	Clydebank	1894	205·6	19·5	5·25	2	280	4,400	28·05	1–12 pr. 5–6 prs.	2	50	50
Swordfish	Elswick	1895	200	19	5·3	2	300	4,100	[27]	1–12 pr. 5–6 prs.	2	45	60
Teazer	East Cowes	1895	200	19·5	5·6	2	270	4,500	[27]	1–12 pr. 5–6 prs.	2	50	60
Wizard	East Cowes	1895	200	19·5	5·2	2	270	4,400	[27]	1–12 pr. 5–6 prs.	2	45	60
Zebra	Blackwall	1895	200	20	6	2	300	3,850	27·00	1–12 pr. 5–6 prs.	2	50	60
Zephyr	Paisley	1895	200	19	5·3	2	270	3,850	[27]	1–12 pr. 5–6 prs.	2	50	60
†Albatross	Chiswick	1898	227·6	21·25	8·5	2	360	7,900	32	1–12 pr. 5–6 prs.	2	68	100
†Angler	Chiswick	1896	210	19·6	7·1	2	278	5,800	30·37	1–12 pr. 5–6 prs.	2	60	80
Arab	Clydebank	1901	218	20·0	5·6	2	360	6,000	31	1–12 pr. 5–6 prs.	2	60	80
†Ariel	Chiswick	1897	210	19·6	7·1	2	278	5,800	30·59	1–12 pr. 5–6 prs.	2	60	80
†Avon	Barrow	1896	210·6	21·6	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Bat	Jarrow	1896	215	20·75	6·8	2	326	6,185	30·1	1–12 pr. 5–6 prs.	2	60	91
†Bittern	Barrow	1897	210·6	21·6	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Brazen	Clydebank	1896	218	20·0	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	60	80
†Bullfinch	Hull	1901	210	20·6	5·8	2	300	5,800	30	1–12 pr. 5–6 prs.	2	60	80
Chamois	Jarrow	1896	215	20·75	6·8	2	325	6,333	30·2	1–12 pr. 5–6 prs.	2	60	91
†Cheerful	Hebburn	1897	210	21·0	8	2	308	6,000	30	1–12 pr. 5–6 prs.	2	62	82
†Coquette	Chiswick	1898	210	19·5	7·2	2	285	5,800	30·31	1–12 pr. 5–6 prs.	2	60	80
Crane	Jarrow	1896	215	20·7	6·8	2	324	6,336	30·3	1–12 pr. 5–6 prs.	2	60	80
†Cygnet	Chiswick	1898	210	19·5	7·2	2	285	5,800	30·35	1–12 pr. 5–6 prs.	2	60	80
†Cynthia	Chiswick	1898	210	19·5	7·2	2	285	5,800	30·2	1–12 pr. 5–6 prs.	2	60	80
†Desperate	Chiswick	1895	210	19·6	7·2	2	275	5,800	30	1–12 pr. 5–6 prs.	2	60	80
†Dove	Hull	1901	210·0	20·6	5·8	2	300	5,800	30	1–12 pr. 5–6 prs.	2	60	80
Earnest	Birkenhead	1896	210·6	21·7	5·3	2	300	6,000	30·13	1–12 pr. 5–6 prs.	2	58	80
Electra	Clydebank	1901	218	20·0	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Express	Birkenhead	1897	227·6	22·0	9	2	300	9,000	31	1–12 pr. 5–6 prs.	2	60	80
Fairy	Fairfield	1897	227·6	22·0	9	2	300	6,000	30	1–12 pr. 5–6 prs.	2	60	80
†Falcon	Fairfield	1901	220	21·3	9	2	300	6,000	30	1–12 pr. 5–6 prs.	2	60	80
†Fame	Chiswick	1896	210·6	19·6	7·1	2	275	5,800	30·16	1–12 pr. 5 6 prs.	2	60	80

* Built by Yarrow, fitted with Thornycroft W. T. boilers at Earle's. All Jarrow-built destroyers have Reed's boilers. Vessels marked † have Thornycroft W. T. boilers.

The Cobra and Viper have been lost.

Great Britain and Dependencies—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Mean Speed on Trial, or expected.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
TORPEDO BOAT DESTROYERS			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Fawn	Jarrow	1897	215	20·7	6·8	2	325	6,581	30·5	1–12 pr. 5–6 prs.	2	60	91
Flirt..	Jarrow	1897	215	20·7	6·8	2	323	6,682	30	1–12 pr. 5–6 prs.	2	60	91
Flyingfish	Jarrow	1897	215	20·7	6·8	2	323	6,416	30·4	1–12 pr. 5–6 prs.	2	58	91
†Foam	Chiswick ..	1896	210	19·6	7·1	2	275	5,800	30·18	1–12 pr. 5–6 prs.	2	58	80
Gipsy	Fairfield ..	1897	227·6	22·0	9	2	300	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Greyhound	Hawthorn's ..	1900	210	21	8·6	2	316	6,000	30	1–12 pr. 5–6 prs.	2	60	90
Griffon	Birkenhead ..	1896	210·0	20	5·3	2	300	6,000	30·11	1–12 pr. 5–6 prs.	2	58	80
Kestrel	Clydebank ..	1901	218	20·0	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Kangaroo..	Jarrow	1901	215	20·75	6·8	2	335	6,500	30	1–12 pr. 5–6 prs.	2	..	91
†Lee	Sunderland ..	1899	210·0	19·9	7·6	2	283	5,400	30	1–12 pr. 5–6 prs.	2	58	80
Leopard	Barrow	1897	210	20·0	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Leven	Fairfield ..	1901	218·0	20.0	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Lively	Clydebank ..	1901	218	20·0	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Locust	Birkenhead ..	1896	210	21·7	5·3	2	300	6,000	30·16	1–12 pr. 5–6 prs.	2	58	80
†Mallard	Chiswick ..	1896	210·6	19·6	7·1	2	275	5,800	30·11	1–12 pr. 5–6 prs.	2	60	80
Mermaid	Hebburn ..	1898	210	21·0	8	2	308	6,000	30	1–12 pr. 5–6 prs.	2	62	82
Myrmidon	Jarrow	1901	215	20·75	6·8	2	335	6,500	30	1–12 pr. 5–6 prs.	2	..	91
*Orwell	Birkenhead ..	1901	218·0	20·0	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Osprey	Fairfield ..	1901	227·6	22·0	9	2	300	6,000	30	1–12 pr. 5–6 prs.	2	60	80
†Ostrich	Fairfield ..	1901	210	21·0	9	2	300	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Otter..	Barrow	1896	210	20·0	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	60	80
Panther	Birkenhead ..	1897	210·6	21·7	5·3	2	300	6,000	30·14	1–12 pr. 5–6 prs.	2	58	80
Peterel	Jarrow	1899	215	20·75	6·8	2	334	6,500	30	1–12 pr. 5–6 prs.	2	..	91
Quail	Birkenhead ..	1895	213·6	21·6	5·3	2	300	6,000	30·38	1–12 pr. 5–6 prs.	2	58	90
Racehorse	Hawthorn's..	1900	210	21	8·6	2	316	6,000	30	1–12 pr. 5–6 prs.	2	60	90
Recruit	Glasgow ..	1901	218·0	20·0	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Roebuck..	Hawthorn's..	1901	210	21	8·6	2	316	6,000	30	1–12 pr. 5–6 prs.	2	60	90
Seal	Birkenhead ..	1897	218·0	20·0	5·6	2	300	6,000	30·15	1–12 pr. 5–6 prs.	2	58	80
Sparrowhawk	Birkenhead ..	1896	210·6	21·7	5·3	2	300	6,000	30·13	1–12 pr. 5–6 prs.	2	58	80
Spiteful	Jarrow	1898	215	20·75	6·8	2	334	6,500	30·1	1–12 pr. 5–6 prs.	2	..	91
Sprightly	Clydebank ..	1901	218	20·0	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	58	80
†Stag	Chiswick ..	1899	210	19·75	7·2	2	285	5,800	30	1–12 pr. 5–6 prs.	2	60	80
Star	Jarrow	1896	215	20·75	6·88	2	328	6,266	30·7	1–12 pr. 5–6 prs.	2	58	91
Success	Sunderland ..	1901	210·0	21·0	9·2¾	2	350	6,000	30	1–12 pr. 5–6 prs.	2	62	43
†Sylvia	Sunderland ..	1901	210	19·9	7·6	2	283	5,400	30	1–12 pr. 5–6 prs.	2	58	80
Syren	Jarrow	1901	215	20·75	6·8	2	335	6,500	30	1–12 pr. 5–6 prs.	2	..	91
Thorn	Glasgow ..	1901	210	21	5·5	2	300	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Thrasher	Birkenhead ..	1896	210·6	21·7	5·3	2	300	6,000	30·13	1–12 pr. 5 6 prs.	2	58	80
Tiger	Glasgow ..	1901	210	21	5·5	2	300	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Vigilant	Glasgow ..	1901	210	21	5·5	2	300	6,000	30	1–12 pr. 5–6 prs.	2	58	80
†Violet	Sunderland ..	1901	210	20·75	6·88	2	283	5,400	30	1–12 pr. 5–6 prs.	2	58	80
Virago	Birkenhead ..	1896	210·6	21·7	5·3	2	300	6,000	30·13	1–12 pr. 5–6 prs.	2	58	80
*a*Vixen	Barrow	1901	210·0	20·0	5·8	2	327	6,000	30	1–12 pr. 5–6 prs.	2	62	88
Vulture	Clydebank ..	1901	218	20	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Whiting	Jarrow	1896	215	20·75	6·88	2	330	6,239	30·2	1–12 pr. 5–6 prs.	2	58	92
Wolf	Birkenhead ..	1897	218	20	5·6	2	300	6,000	30	1–12 pr. 5–6 prs.	2	58	80
Derwent	Hawthorn ..	Bldg.	220	23	10	2	534	7,000	25	1–12 pr. 5–6 prs.	2	70	130
‡Eden	Parsons ..	1903	220	23	8¼	6	527	7,000	25	1–12 pr. 5 6 prs.	2	70	130
Exe	Palmer	Bldg.	225	23½	10	2	540	7,000	25½	1–12 pr. 5–6 prs.	2	70	95
													127
Ribble	Yarrow.. ..	,,	225	23½	10	2	550	7,500	26	1–12 pr. 5–6 prs.	2	70	120
Itchen	Laird	1903	225	23½	10	2	550	7,000	25½	1–12 pr. 5–6 prs.	2	70	130
Usk	Yarrow.. ..	Bldg.	225	23½	10	2	550	7,500	26	1–12 pr. 5 6 prs.	2	70	120
Teviot	Yarrow.. ..	,,	225	23½	10	2	550	7,500	26	1–12 pr. 5 6 prs.	2	70	120
Ettrick	Palmer	,,	225	23½	10	2	540	7,000	25½	1–12 pr. 5–6 prs.	2	70	95
													127
Foyle	Laird	1903	225	23½	10	2	550	7,000	25½	1–12 pr. 5–6 prs.	2	70	120
Erne	Palmer	1903	225	23½	10	2	540	7,000	25½	1–12 pr. 5 6 prs.	2	70	95
													127
Arun	Laird	Bldg.	225	23½	10	2	550	7,000	25½	1–12 pr. 5–6 prs.	2	70	130
Blackwater	Laird	,,	225	23½	10	2	550	7,000	25½	1–12 pr. 5 6 prs.	2	70	130
Cherwell..	Palmer	,,	225	23½	10	2	540	7,000	25½	1–12 pr. 5–6 prs.	2	70	95
													127
Dee	Palmer	,,	225	23½	10	2	540	7,000	25½	1–12 pr. 5–6 prs.	2	70	95
													127
Jed	Thornycroft..	,,	225	23½	10	2	540	7,000	25½	1–12 pr. 5–6 prs.	2	70	130
Kennet	Thornycroft..	,,	225	23½	10	2	540	7,000	25½	1–12 pr. 5–6 prs.	2	70	130
‡Velox	Parsons ..	,,	210	23	8½	8	440	8,000	27	1–12 pr. 5 6 prs.	2	63	90
Waverney	Hawthorn ..	,,	220	23½	10	2	534	7,000	25	1–12 pr. 5–6 prs.	2	70	130
Wellend	Yarrow.. ..	,,	225	23½	10	2	550	7,500	26	1–12 pr. 5–6 prs.	2	70	120
Fifteen new boats. Programme 1903–4. Design not complete.													
TORPEDO BOATS— FIRST CLASS—													
1 (*ex* Lightning)	Chiswick ..	1877	84·6	10·9	5	1	27	460	19	..	1	..	
2–9 (8 boats)	Chiswick ..	1878–9	87	10·9	4	1	28	450	20	..	1	15	
10	Chiswick ..	1880	90·5	10·9	4	1	28	450	21·7	..	1	15	
11, 12 (2 boats)	Chiswick ..	1880	87	10·9	4	1	28	450	20	..	1	15	7
13	Lambeth ..	1878	87	10·9	4	1	28	460	21	..	2	15	7
14	Poplar	1878	87	11	4·5	1	33	550	22	..	2	15	7
15	..	..	87	10·9	4	1	28	450	21	..	2	15	7

* Under repair after collision. ‡ Hulls and Yarrow boilers of these vessels by Hawthorn Leslie & Co.
a Has four Express W. T. boilers.

Great Britain and Dependencies—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
RPEDO BOATS.			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
RST CLASS—*cont.*													
17, 18 (2 boats)	Poplar	1877	86	11	4·5	1	33	450	21	..	2	15	7
9	East Cowes ..	1878	87	10·9	4	1	28	460	21	..	2	15	7
20	..	1880	87	10	4	..	28	360	16·9	..	2	15	
21, 22 (2 boats)	Chiswick ..	1885	113	12·5	5·7	1	63	730	20	..	3	..	10
23, 24 (2 boats)	Poplar	1885–6	113	12·5	5·5	1	67	600	19·5	2–3 prs.	3	..	
25–29 (5 boats)	Chiswick ..	1886	127·5	12·5	6·2	1	60	600	21	..	4	15	
30–33 (4 boats)	Poplar	1886	125	13	5·5	1	60–66	670	19·5	2–3 prs.	5	15	20
34–38 (5 boats)	East Cowes ..	1886	125	14·6	4	1	60–66	950	18–19	..	5	15	
39, 40 (2 boats)	Poplar	1885	100	12·5	..	..	40	500	..	..	1	15	
41–60 (20 boats)	Chiswick ..	1886	127·5	12·5	6·2	1	60	700	21	2–3 prs.	4	15	
61, 63–74, 76–78 (16 boats)	Poplar	1886	125	13	5·5	1	75	700	19–20	2–3 prs.	5	15	20
79	Poplar	1886	125	13	5·5	..	75	1,000	22·4	2–3 prs.	..	15	20
80	Poplar	1887	135	14	6	1	105	1,540	23	4–3 prs.	5	21	30
81 (*ex* Swift)	East Cowes ..	1885	150	17·5	..	1	125	..	..	6–3 prs.	3	25	35
82–87 (6 boats)	Poplar	1889	130	13·5	5·5	1	85	1,100	23	3–3 prs.	3	19	20
88, 89 (2 boats)	Poplar	1894	142	14·75	4·5	1	112	1,600	..	3–3 prs.	3	18	20
90	Poplar	1895	140	14·25	3·7	1	100	1,430	..	3–3 prs.	3	18	18
91, 92 (2 boats)	Chiswick ..	1894	140	15·5	7·5	1	130	2,400	23-24	3–3 prs.	3	18	25
93	Chiswick ..	1893	140	15·5	5·4	2	130	2,200	23·5	3–3 prs.	3	18	25
94–96 (3 boats)	East Cowes ..	1894	140	15·5	..	1	130	2,000	23·2	3-3 prs.	3	18	25
97	Birkenhead ..	1893	140	15·5	..	1	130	2,690	23·35	3–3 prs.	3	18	25
98 and 99 .. .. .. / 107 and 108	Chiswick ..	1901	160	17	8·4	1	178	2,850	25	3–3 prs.	3	32	20
109-113	Chiswick ..	1902	166	17·25	8·4	1	200	2,900	25	3–3 prs.	3	32	42
114–117	Cowes	1903	165	17·6	8·8	1	205	2,900	25	3–3 prs.	3	32	23
COND CLASS—													
8–48 (10 boats)	Poplar	1889	60	9·2	3·7	1	16·5	230	16·5	1 mach.	1	9	11
9, 50 (2 boats)	Poplar	1887	60	8·5	3	1	15	200	17	1 mach.	1	9	
1–62 (12 boats)	Chiswick ..	1878–9	60·5	7·5	3·5	1	..	..	16·5	..	2	7	
3	..	1879	60	..	..	1	..	..	15	..	2		
4–73 (10 boats)	Chiswick ..	1880–1	60·5	7·5	3·5	1	..	..	16–17	..	2	7	
4, 75, 96, 97 (4 boats)..	Poplar	1883	62	7·6	3·6	1	12	..	16	1 mach.	2	7	
6–95 (20 boats)	Chiswick ..	1882–3	63	7·5	3·5	1	..	..	16·5–17	..	2	7	
8	Chiswick ..	1883	66·3	7·5	2·5	hyd.	..	120	12·6	..	2	7	
9, 100 (2 boats)	Chiswick ..	1886	64	8	3·6	1	..	..	16–16·8	..	2	7	
01	..	..	64	..	..	..	..	..	..	..	2	7	
–9 (9 boats)	East Cowes ..	..	56	..	..	1	12	..	14·5	2 mach.	sp	..	·7
LONIAL, ETC.—													
Victoria.													
lders	Chiswick ..	1883	113	12·5	5·9	1	65	730	20	2–1 prs.	..	12	10
e boat	Poplar	1891	130	13·5	5·7	1	82	1,150	23	3–3 prs.	3	19	20
pean, Lonsdale (2 boats)	Chiswick ..	1884	63	7·5	3·2	1	12	150	17·5	..	1	7	
New South Wales.													
heron, Avernus (2 boats)	..	1879	..	..	..	1	16	300	16				
Queensland.													
squito	Chiswick ..	1884	63	7·5	3·2	1	12	..	17	..	1	7	
asp	..	..	..	..	..	..	12	..	..	..	..	7	
Tasmania.													
e boat	Chiswick ..	1884	63	7·5	3·2	1	12	..	17	..	1	7	
New Zealand.													
s. 1–4 (4 boats)	Chiswick ..	1884	63	7·5	3	1	12	170	17	1 mach.	Sp.		
India.													
s. 1–3 (3 boats)	Chiswick ..	1888	134·5	14·8	7·1	1	96	1,270	23·2	2 Q.F.	5		
s. 4–6 (3 boats)	East Cowes ..	1889	130	14·6	..	..	95	1,030	20				
.7	Paisley	1888	130·4	14	..	..	92	1,060	21				
BMARINES—													
boats building	Barrow	1901–1	63·4	11·9	..	..	120	{160 / 70	8 / 7}	..	1	..	..
new boats (programme 1902–03).	Barrow	..	..	..	..	..	..	..	..	..	..	..	..
0 new boats (programme 1903–4).	Barrow	..	..	..	..	..	..	..	..	..	..	..	..

a No. 34 is fitted with Laird W. T. boilers. *b* Water-tube boilers of Thornycroft type.

Argentine Republic.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Corrientes	Poplar.. ..	1896	190	19·6	7·4	2	280	4,000	27·4 *t.*	*1 14-pr.	3	54	80
Misiones..	Poplar.. ..	1896	190	19·6	7·4	2	280	4,000	26·0 *t.*	3 6-pr,	3	54	80
Entre Rios	Poplar.. ..	1896	190	19·6	7·4	2	280	4,000	26·7 *t.*	Q.F., 2 M.	3	54	80
FIRST CLASS—													
2 boats	Chiswick ..	1890–1	150	14·5	5·2	2	110	1,500	24·52	3 3-prs.	3	27	22
6 boats	Poplar.. ..	1890	130	13·5	6	1	85	1,200	23–24	2 3-pr. Q.F.	2	15	15
4 boats	Poplar.. ..	1880–2	100	12·5	6	1	52	600	20	2 mach.	3	14	10
SECOND CLASS—													
Nos. 1–8 (8 boats)..	Poplar.. ..	1890	60	9.2	3	1	16	230	17	1 Q.F.	1	10	1·25
Nos. 9–10 (2 boats)	Chiswick ..	1881	60	7·5	3·5	1	16	230	17	..	1		

The two 150-ft. boats are named Comodoro Py and Murature.

The six 130-ft. boats are named Bathurst, Buchardo, Jorge, King, Pinedo, and Thorne. They have locomotive boilers.

The four 100-ft. boats are named Alerta, Centella, Ferre, and Py.

* ½-in. plating over entire engine and boiler space (Yarrow W.T. boilers).

Austria-Hungary.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
FIRST CLASS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Adler, Falke	Poplar.. ..	1886	135	13·7	5·6	1	95	900	22·4	2 Nord.	2	16	28
22 boats	Elbing, Trieste, &c.	1886–9	128	15·9	6·9	1	83	900 1,000	17·5 to 21·5	2 mach.	2	15	28
Boa .. .. Cobra .. .. .. Kigyo .. .. .. Python	Poplar.. ..	1898–9	152·6	15·3	7·6	1	133	2,000	24·3	2 3-pr. Q.F.	3	24	30
Viper	Poplar.. ..	1896	147·6	14·9	7·6	1	130	2,000	26·5	2 3-pr. Q.F.	2	26	30
Natter	Elbing ..	1896	150	17·5	8·8	2	152	2,300	26·5	2 3-pr. Q.F.	3	..	30
SECOND CLASS—													
Nos. 9, 10 (2 boats)	Chiswick, Poplar, Pola and Elbing	1881	98·5	10·8	2·9	1	37	450	17	1 Q.F.	1		
Nos. 11–32 (22 boats)		1883–7	107	11·6	3·1	1	47	600	17				
Nos. 33–39 (7 boats)		1887–91	118·1	14·4	3·3	1	64	700	18	2 Q.F.	1		
Nos. 2–8 (7 boats) ..	Pola and Poplar ..	1878–81	87·4	9·6	2·8	1	27	300	15	..	1		

No provision is made for the building of torpedo craft in 1903.

Brazil.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
FIRST CLASS—													
Nos. 1-5 (5 boats)	Poplar.. ..	1882	100	12·5	5·5	1	52	600	20	2 mach.	2	16	20
Araguary	Chiswick ..	1891	150	14·5	5·2	2	150	1,550	25·1	2 Q.F.	4	27	22
Iguatemi	Chiswick ..	1891	150	14·5	5·2	2	150	1,550	25·4	2 Q.F.	4	27	22
Marcilio Diaz	Chiswick ..	1891	150	14·5	5·2	2	150	1,550	25·8	2 Q.F.	4	27	22
5 boats	Elbing ..	1892–3	152	17·2	7·9	2	130	2,200	28	2–1 prs.	3	24	30
Piratiny	..	..	130	12	..	..	..	..	10	2–1 pr.	1		
Poty	..	..	126	12	3	..	30	..	18	1–1 pr.	1		
SECOND CLASS—													
Inbanhuay (wood)..	New York..	1893	90	10	3	..	17	..	25	1–1 pr.	1	10	
4 boats	..	1883–4	..	..	..	1	17	..	17				
1 boat	Chiswick ..	1885	63	75	3·2	1	..	..	17	..	..	..	2
1 boat	Poplar.. ..	1886	60	8	3	1	14	200	17	..	1		
THIRD CLASS—													
Moxoto	Poplar.. ..	1883	60	9·3	..	..	..	..	16	1–1 pr.	1		
5 boats	Chiswick ..	1883	45	6	1·2	1	3·5	..	12-13	1 mach.	sp.		

Two submarine boats, Jacinto Gomez and Mello Marques, in hand.

Chili.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
DESTROYERS—													
Capitan Orella ..	Birkenhead.	1896	210	21·6	5·4	2	300	6000	30·17	1-12 pr. Q.F. 5-6 pr.	2	65	90
Capitan Munoz Gamero.. ..	Birkenhead.	1896	210	21·6	5·4	2	300	6000	30·42	1–12 pr. Q.F. 5-6 pr.	2	65	90
Teniente Serrano ..	Birkenhead.	1896	210	21·6	5.4	2	300	6000	30·35	1–12 pr. Q.F. 5-6 pr.	2	65	90
Guardia-Marina Riquelme ..	Birkenhead.	1896	210	21·6	5·4	2	300	6000	30·09	1–12 pr. Q.F. 5-6 pr.	2	65	90
Capitan Merino Tarpa .. .. .. Capitan O'Brien ..	Birkenhead.	1901	210	21·6	5·4	2	350	6000	30	Do.	2	65	90
FIRST CLASS—													
3 boats	Poplar.. ..	1881	86	12·5	..	1	25	400	19–20	..	4	15	
5 boats	Poplar.. ..	1881	100	12·5	..	1	35	400	18–19	4 mach.	4	15	9
Sarjento Aldea ..	Poplar.. ..	1886	125	13·5	5·5	1	70	800	20	2 Q.F.	4	18	15
Injeniero Hyatt, Cirujano Videla, Injeniero Mutilla, Guardia-Marina Contreras, Capitan Thompson, and Teniente Rodriguez (Viper type) ..	Poplar.. ..	1896 1898	152·6	15·3	7·9	1	140	2200	27·5 27·2	3-3 pr. Q.F.	3	28	40
Janequeo, Guale, Rucumilla, and Guacolda	Poplar.. ..	1881	100	12·5	..	1	..	450	..	..	..	..	
Tegualda, Quidora, and Fresia	Poplar.. ..	..	87	10·9	..	1	..	400	..	..	..	..	
SECOND CLASS—													
1 boat	East Cowes	1887	50	..	..	..	..	..	16	..	..	..	
1 boat	East Cowes	1892	60	9·6	5	1	15	270	19	..	1	..	
1 boat	La Seyne ..	1895	42	8·6	..	1	..	..	..	..	1	..	

The Thompson and Rodriguez were sent out in sections, and put together at Talcahuano and Valparaiso.

The torpedo boat Injeniero Mery was totally wrecked at San Antonio, March, 1903.

China.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons
First Class—													
1 boat	Elbing ..	1886	144·3	16·4	7·5	1	128	1,400	24·2	4 1-pr. revs.	2	20	15
1 boat	Poplar.. ..	1887	128	13	5	1	69	1,000	23·9	3 Q.F., 4 Gatlings	3	28	15
25 boats	Stettin, &c. .	1886–87	110	13	4·9	1	65	1,000	19·5	1-pr. revs.	3	16	10
2 boats	Stettin ..	1883	86	10·4	3·4	1	28	650	18·2	1-pr. revs.	2	16	12
1 boat	Stettin ..	1884	123·5	21·7	..	..	..	..	19	..	5	16	
2 boats	Elbing ..	1895	128	15·8	..	..	120	1,250	24·5	Q.F.	2		
Second Class—													
11 boats	Elbing ..	1885–86	85	11·9	4·8	1	27	400	19	..	1	..	5
1 boat	Foochow ..	Bldg.	88·6	6·7	3·3	1	30	550	20·5				

About twenty boats only are said to be serviceable. The four destroyers built at Elbing in 1898–9 were captured by the Allies at Taku, 1900, and added to the navies of Great Britain, France, Germany and Russia.

Costa Rica.

Costa Rica has one 62-ft., 15-knot boat.

Denmark.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
First Class—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Hajen	Copenhagen	1896											
Havörnen	Copenhagen	1897	154·3	15·4	7·9	2	142	2,317	22·9	1 4·7-in. 1 1-pr.	3	..	..
Söbjörnen	Copenhagen	1898											
Delfinen	Chiswick ..	1883	111·5	12·6	6	1	59	620	20	1 mach.	2	14	9
Havhesten	Chiswick ..	1888	137·9	14	7	1	94	1,200	22·8	2 1-pr. revs.	4	20	15
Hvalrossen	Chiswick ..	1884	114	12·6	6·5	1	61	660	18·7	1 mach.	2	14	10
Makrelen	Copenhagen	1893	140	14·2	7	2	112	1,200	..	..	..	..	16
Narhvalen	Chiswick ..	1888	137·9	14	7	1	94	1,200	22·3	2 1-pr. revs.	4	20	15
Nord Kaperen.. ..	Copenhagen	1893	140	14·2	7	2	112	1,200	..	2 1-pr. revs.	4	..	16
Sölöven	Chiswick ..	1887	131	14·8	6·8	1	89	1,200	23·3	2 mach.	4	20	14
Sóulven	Havre.. ..	1880	94·8	10·9	3·9	1	37	450	18·1	..	2	12	5
Springeren	Copenhagen	1891	119	13	4·9	1	81	800	18·3	2 1-pr. revs.	2	20	14
Stören	Chiswick ..	1887	131	14·8	6·8	1	89	1,200	23	2 mach.	4	20	14
Sværdfisken	Chiswick ..	1881	110	12	6	1	49	600	20·7	1 mach.	2	14	9
Second Class—													
Nos. 4, 5 (2 boats) ..	Chiswick ..	1882	63	7·5	2·5	1	15	150	16·9	1 mach.	2	6	1
Nos. 6, 7 (2 boats) ..	Chiswick ..	1884	66·8	8	4·2	1	16	170	15·4	1 mach.	2	6	1·5
Nos. 8, 9 (2 boats) ..	Chiswick ..	1886	69·5	8·1	3·8	1	17	170	15·7	1 mach.	2	6	1
Nos. 10, 11 (2 boats).	Chiswick ..	1888	70·2	8	4	1	18	180	15·8	1 mach.	2	6	1
Nos. 12, 13 (2 boats).	Chiswick ..	1889	78·3	9	4·9	1	24	350	18	1 mach.	2	8	3
1 boat	Chiswick ..	1875	58	7·5	3	1	..	..	16	..	sp.		

Four destroyers and two boats are provided for.

France.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Arbalète	Normand ..	1902	183·9	20·11	10·3	2	300	6000	26	1-9pr. 6-3prs.	2	62	75
Arc	Châlon ..	Bldg.	183·9	20·11	10·3	2	300	6000	26	1-9pr. 6-3prs.	2	62	75
Arquebuse..	Normand ..	1902	183·9	20·11	10·3	2	300	6000	..	1-9pr. 6-3prs.	2	62	75
Baliste	Rouen ..	Bldg.	183·9	20·11	10·3	2	300	6000	26	1-9pr. 6-3prs.	2	62	75
Bélier	Nantes ..	Bldg.	183·9	20·11	10·3	2	300	6000	26	1-9pr. 6-3prs.	2	62	75
Bombarde	Havre (F.&C.)	Bldg.	183·9	20·11	10·3	2	300	6000	26	1-9pr. 6-3prs.	2	62	75
Carabine	Rochefort ..	1902	183·9	20·11	10·3	2	300	6000	..	1-9pr. 6-3prs.	2	62	75
Catapulte	Havre (F.&C.)	Bldg.	183·9	20·11	10·3	2	300	6000	26	1-9pr. 6-3prs.	2	62	75
Dard	Rouen ..	Bldg.	183·9	20·11	10·3	2	300	6000	26	1-9pr. 6 3prs.	2	62	75
Durandal	Normand ..	1899	180·5	20·8	10·3	2	300	5000	27·4	1-9pr. 6-3prs.	2	62	84
Epée	Havre (F.&C.)	1900	183·9	20·8	10·3	2	300	5700	26	1-9pr. 6-3prs.	2	62	75
Epieu	Normand ..	1902	183·9	20·11	10·3	2	300	6000	..	1-9pr. 6-3prs.	2	62	75
Escopette	Rochefort ..	1900	183·9	20 8	10·3	2	300	5700	26	1-9pr. 6-3prs.	2	62	75
Espingole†	Normand ..	1900	183·9	20·8	10·3	2	300	5000	27·2	1-9pr. 6-3prs.	2	62	84
Fauconneau	Normand ..	1900	183·9	20·8	10·3	2	300	5000	27·1	1-9pr. 6-3prs.	2	62	84
Flamberge..	Rochefort ..	1901	183·9	20 8	10·3	2	300	5700	26	1-9pr. 6-3prs.	2	62	75
Francisque..	Rochefort ..	Bldg.	183·9	20·11	10·3	2	300	6000	26	1-9pr. 6-3prs.	2	62	76
Fronde	Bordeaux ..	1902	183·9	20·11	10·3	2	300	6000	28	1-9pr. 6-3prs.	2	62	65
Hallebarde	Normand ..	1899	180·5	20·8	10·3	2	300	5000	27·2	1-9pr. 6-3prs.	2	62	84
Harpon	Bordeaux ..	1902	183·9	20·11	10·3	2	300	6000	28	1-9pr. 6-3prs.	2	62	75
Javeline	Nantes ..	Bldg.	183·9	20·11	10 3	2	300	6000	..	1-9pr. 6 3prs.	2	62	75
Mousquet	Nantes ..	1902	183·9	20·11	10·3	2	300	6000	..	1-9pr. 6-3prs.	2	62	75
Mousqueton	Châlon ..	Bldg.	183·9	20·11	10·3	2	300	6000	26	1-9pr. 6-3prs.	2	62	75
Pertuisane..	Rochefort ..	1900	183·9	20·8	10·3	2	300	5700	26	1-9pr. 6-3prs.	2	62	75
Pique	Havre (F.&C.)	1900	183·9	20·8	10·3	2	300	5700	26	1-9pr. 6-3prs	2	62	75
Pistolet	Nantes ..	Bldg.	183·9	20·11	10·3	2	300	6000	26	1-9pr. 6-3prs.	2	62	75
Rapière	Rochefort ..	1901	183·9	20·8	10·3	2	300	5700	26	1-9pr. 6-3prs.	2	62	75
Sabre	Rochefort ..	Bldg.	183·9	20·11	10·3	2	300	6000	26	1-9pr. 6-3prs.	2	62	75
Sagaïe..	Havre (F.&C.)	1902	183·9	20·11	10·3	2	300	6000	..	1-9pr. 6-3prs.	2	62	75
Sarbacane	Rochefort ..	Bldg.	183·9	20·11	10·3	2	300	6000	..	1-9pr 6-3prs.	2	62	75
Stylet	..	Bldg.	183·9	20·11	10·3	2	300	6000	..	1-9pr. 6-3prs.	2	62	75
Takou*	Elbing ..	1898	193·7	21·0	..	2	280	6000	35	6-3 pr. Q.F.	2	62	67
Tromblon	..	Bldg.	193·7	21 0	..	2	280	6000	35	6-3 pr. Q.F.	2	62	67
Yatagan	Nantes ..	1900	183 9	20·8	10·3	2	300	5700	26	1-9pr. 6-3prs.	2	62	38
M 34 to 37	..	Bldg.	183 9	19·6	10·3	2	303	4800	26	1-9 pr.	2	62	37
M 40 to 43..	Rochefort ..	Pro.	183·9	20·11	10·3	2	300	6000	..	1-9pr. 6-3prs.	2	62	75
SEA-GOING—													
Agile	La Seyne ..	1889	139	14·7	7·7	2	121	1,100	20·4	3-3 prs.	2	26	14
Alarme	St. Nazaire	1889	151	15·7	8·3	2	169	1,400	20·5	2-3 prs.	4	30	40
Aquilon	Normand ..	1895	137·8	14·6	7·9	2	127	2,000	23·17	2-3 prs.	2	34	17
Archer	Normand ..	1893	138	14·7	6·5	2	131	1,250	21	2-3 prs.	2	26	17
Argonaute..	St. Denis ..	1893	141	16·4	9·3	2	133	1,500	25·1	2-3 prs.	2	34	16
Audacieux..	Nantes ..	1900	144·2	15·2	10·0	2	152	4,200	30	2-3 prs.	2	..	18
Aventurier	St. Nazaire..	1889	151	15·7	8·3	2	174	1,400	20·5	2-3 prs.	4	34	40
Averne	Havre (F.&C.)	1894	141	16·4	9·3	2	133	1,500	24·4	2-3 prs.	2	27	16
Borée	Bordeaux ..	1900	147·7	16·7	8·0	2	160	4,400	30	2-3 prs.	2	..	18
Bourrasque	Normand ..	1901	147·7	16·7	8·0	2	160	4,400	31·41	2-3 prs.	2	..	18
Cerbère	..	1899	137·8	14·6	7·9	2	127	2,000	25	2-3 prs.	2	34	17
Chevalier	Normand ..	1893	144·3	15·7	6·8	2	134	2,700	27·2	2-1 prs.	2	32	17
Corsaire	St. Denis ..	1893	160·5	15	5·4	2	171	2,500	25·5	4-1 prs.	2	32	15
Coureur	Chiswick ..	1888	147·5	14·5	4·6	2	129	1,550	23·28	4 Nords.	2	27	22
Cyclone (ex-Tenare) ..	Normand ..	1898	144·2	15·2	10·0	2	152	4,200	30	2-3 prs.	2	..	19
Dauphin	Havre (F.&C.)	1894	141	16·4	9·3	2	137	1,500	25·22	2-3 prs.	2	34	16
Défi	St. Nazaire..	1889	151	15·7	8·3	2	173	1,400	21	2-3 prs.	4	30	40
Dragon	Normand ..	1892	138	14·7	8·2	2	129	1,400	25	2-3 prs.	2	26	15·5
Eclair	La Seyne ..	1891	144·3	14·7	7·7	2	128	1,100	21·5	3-3 prs.	2	26	17
Flibustier	Normand ..	1894	143	16·4	9·3	2	132	1,500	23·5	2-3 prs.	2	34	16
Forban	Normand ..	1895	144·2	15·2	10	2	135	3,200	31·2	2-1 prs.	2	..	..
Grenadier	Normand ..	1892	138	14·7	8·2	2	129	1,400	25·25	2-3 prs.	2	26	15·5
Grondeur	Havre (F.&C.)	1892	147·5	14·5	5	2	130	1,550	24	2-3 prs.	2	27	20
Kabyle	La Seyne ..	1891	144·3	14·7	7·7	2	128	1,100	21·6	3-3 prs.	2	27	17
Lancier	Normand ..	1893	138	14·7	8·2	2	128	1,400	25·79	2-3 prs.	2	26	15·5
Mangini	Nantes ..	1896	147·6	14·8	7·9	2	129	2,100	27·5	2-3 prs.	2	34	17
Mistral	Normand ..	1901	147·7	16·8	8·8	2	182	4,200	30	2-3 prs.	3	..	23
Mousquetaire	Havre (F.&C.)	1892	154	15·7	7	2	150	2,100	24·77	2-1 prs.	2	32	18
Orage	La Seyne ..	1891	144·3	14·7	7·7	2	128	1,100	21·7	3-3 prs.	2	26	17
Ouragan	Nantes ..	1887	151	15·7	8·3	2	174	1,400	20	2-3 prs.	4	30	40
Rafale..	Normand ..	1901	147·7	16·7	8·0	2	160	4,400	31·47	2-3 prs.	2	..	18
Sarrasin	Bourdeaux..	1893	139	14·7	7·7	2	131	1,100	20·5	3-3 prs.	2	26	14
Simoun	Havre (F.&C.)	1901	144·2	15·2	10·0	2	152	4,200	30	2-3 prs.	2	..	18
Siroco	Normand ..	1901	147·7	16·8	8·8	2	182	4,200	30	2-3 prs.	3	..	23
Teméraire	St. Nazaire..	1889	151	15·7	8·3	2	174	1,400	21	2-3 prs.	4	30	40
Tourbillon	Bourdeaux..	1892	139	14·7	7·7	2	131	1,100	20·5	3-3 prs.	2	26	14
Tourmente	St. Denis ..	1893	141	16·4	9·3	..	132	1,500	21·6	2-3 prs.	2	25	15
Tramontane	Bordeaux ..	1900	147 7	16·7	8·0	2	160	4,400	30	2-3 prs.	2	..	18
Trombe	Nantes ..	1900	144 2	15·2	10·0	2	152	4,200	30	2-3 prs.	2	..	18
Turco	St. Denis ..	1892	138	14·7	8·2	2	124	1,400	21·3	2-3 prs.	2	26	15·5
Typhon	Havre (F.&C.)	1901	144·2	15·2	10·0	2	152	4,200	30	2-3 prs.	2	..	18
Véloce..	Havre (F.&C.)	1892	147·5	14·5	5	2	130	1,550	23·6	2-3 prs.	2	27	20
Zouave	St. Denis ..	1892	138	14·7	8·2	2	124	1,400	21·3	2-3 prs.	2	26	15·5

* Captured from the Chinese at Taku, 1900. N.B.—"F. & C." "Forges et Chantiers."
"Normand" means that the boat has been built at that firm's yard at Havre.

† The Espingole ran upon a rock off Cape Lardier, Feb. 3, 1903, and foundered in 15 fathoms. It is uncertain whether she can be floated

France—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
FIRST CLASS—													
Balny	Normand ..	1886	131·5	11	7·2	1	66	700	20	2–1 pr. rev.	2	21	12
Bouët-Willaumez	St. Denis ..	1888	134·5	11	7·2	1	66	700	20	2–1 pr. rev.	2	21	12
Capt. Cuny	..	1886	134·5	11	7·2	1	66	700	20	2–1 pr. rev.	2	21	12
Capt. Mehl	..	1886	134·5	11	7·2	1	66	700	20	2–1 pr. rev.	2	21	12
Challier	..	1886	131·5	11	7·2	1	66	700	20	2–1 pr. rev.	2	21	12
Dehorter	St. Denis ..	1886	134·5	11	7·2	1	66	700	20	2–1 pr. rev.	2	21	12
Deroulède	Normand ..	1886	134·5	11	7·2	1	66	700	20	2–1 pr. rev.	2	21	12
Doudart de Lagrée	Normand ..	1886	134·5	11	7·2	1	66	700	20	2–1 pr. rev.	2	21	12
Edmond Fontaine	St. Denis ..	1888	134·5	11	7·2	1	66	700	20	2–1 pr. rev.	2	21	12
126–129 (4 boats)	Normand ..	1889–0	118	13·2	8·6	1	80	1,250	21	2–1 prs.	2	21	10
145–149 (5 boats)	Normand ..	1891–3	118	13·2	8·7	1	79	1,300	23·9	2–1 prs.	2	21	10
152–154 (3 boats)	Normand ..	1892–3	118	13·2	8·7	1	80	1,300	24·6	2–1 prs.	2	21	10
155–157 (3 boats)	Bordeaux ..	1893	118	13·2	8·7	1	80	1,300	23	2–1 prs.	2	21	10
158–160 (3 boats)	Cail	1893	118	13·2	8·7	1	80	1,300	23	2–1 prs.	2	21	10
161–163 (3 boats)	St. Nazaire ..	1892	118	13·2	8·7	1	80	1,300	23	2–1 prs.	2	21	10
164–166 (3 boats)	La Seyne ..	1892	118	13·2	8·7	1	79	1,300	23	2–1 prs.	2	21	10
167–169 (3 boats)	Creusot ..	1892	118	13·2	8·7	1	81	1,300	23	2–1 prs.	2	21	10
170, 171 (2 boats)	Normand ..	1893	118	13·2	8·7	1	80	1,300	23–2	2–1 prs.	2	21	10
172, 173 (2 boats)	Havre	1893–4	118	13·2	8·7	1	89	1,390	23–24	2–1 prs.	2	21	10
174–176 (3 boats)	Havre	1893–5	118	13·2	8·7	1	94	1,390	23-24	2 1-prs.	2	21	10
177–179 (3 boats)	Havre	1893	118	13·2	8·7	1	79	1,300	23–24	2–1 prs.	2	21	10
180–187 (8 boats)	Normand, etc.	1894–5	118	13·2	8·6	1	80	1,500	25·7	2–1 prs.	2	21	10
188–191 (4 boats)	Havre, etc.	1893–4	118	13·2	8·6	1	80	1,500	24–2	2–1 prs.	2	21	10
192–194 (3 boats)	Havre, etc.	1894–5	118	13·2	8·	1	82	1,300	23·55	2–1 prs.	2	21	10
195-200 (6 boats)	Havre, etc.	1894-5	319	13·2	8·7	1	80	1,300	23·5	2 1-prs.	2	21	10
201–205 (5 boats)	Normand ..	1897–8	121·4	13·4	8·6	1	84	1,700	25·9	2–1 prs.	2	23	10
206–211 (6 boats)	Bordeaux ..	1897–8	121·4	13·6	8·6	1	86	1,500	23·5	2 1-prs.	2	23	10
212–215 (4 boats)	Normand ..	1899	121·4	13·6	8·6	1	86	1,800	27	2 1-prs.	2	23	10
216–226 (11 boats) ..	Cherbourg, Toulon, etc.	1899–1902	121·6	13·6	8·6	1	86	1,500	23·5	2–1 prs.	2	23	10
227-235 (9 boats)	Bordeaux, etc.	Bldg.	121·4	13·2	8·7	1	86	1,500	23·5	2-1-prs.	2	23	10
236–255 (20 boats) ..	Bordeaux, etc.	Bldg.	121.4	13·2	8·7	1	86	1,500	23·5	2 1-prs.	2	23	10
256–257 (2 boats)	..	1900	121·4	13·2	8·7	1	86	1,500	23·5	2–1 prs.	2	23	10
258–261 (4 boats)	Bordeaux ..	Bldg.	121·4	13·2	8·7	1	86	1,500	23·5	2–1 prs.	2	23	10
262–263 (2 boats)	Creusot ..	Bldg.	121·4	13·2	8·7	1	86	1,500	23·5	2–1 prs.	2	23	10
264–265 (2 boats)	Bordeaux ..	1902	121·4	13·2	8·7	1	86	1,500	23·5	2–1 prs.	2	23	10
266–276 (11 boats) ..	Bordeaux etc.	1902	123	13·2	9·6	1	86	1,500	23·5	2–1 prs.	2	23	10
277–293 (17 boats) ..	Bordeaux, etc.	Pro.											
8 S, 9 S	Bordeaux, etc.	Bldg.											
P 114–138 (25 boats) ..	Saigon ..	Pro.											
SECOND CLASS—													
26	..	1878	108	11	5·6	1	45	400	19	2–1 prs.	2	16	10
27	..	1878	104·4	10·6	6·1	1	44	400	19	2–1 prs.	2	16	10
28	..	1878	111·5	11	5·6	1	44	400	19	2–1 prs.	2	16	10
60–64 (5 boats)	Normand ..	1883	108·2	10·3	6·1	1	45	400	19	2–1 prs.	2	16	10
65, 66, 68 (3 boats) ..	Normand ..	1884	108·2	10·7	6·4	1	49	500	20	2–1 prs.	2	16	10
70–74 (5 boats)	Normand ..	1885	108·2	10·7	6·5	1	50	500	20	2–1 prs.	2	16	10
75–82, 84–87, 89–109 (33 boats)	Cail, etc. ..	1885–92	114·7	10·6	6	1	54	525	20	2–1 prs.	2	16	10
111–125 (11 boats) ..	La Seyne, etc.	1885–90	114·7	10·6	6	1	54	525	20	2–1 prs.	2	16	10
130–132, 134–144 (14 boats)	Normand ..	1890–91	111·5	11·4	6	1	52·8	520	21	2–1 prs.	2	16	10
THIRD CLASS—													
8, 10–16, 18, 19 (10 boats)	Various Firms in France and England.	1877–82	86	10·2	5	1	27	200–450	16–19	..	..	10	
20			87	10·8	5	1	33			..	..	10	
22, 23 (2 boats)			87·6	10·4	5·2	1	30			..	..	10	
24, 25 (2 boats)			88·5	10·4	6	1	30			..	..	10	
31			85·5	10·4	3·8	1	27			..	..	10	
33–36 (4 boats)			89	10·4	6	1	32			..	..	10	
37–40 (4 boats)			87	10·8	5	1	32			..	..	10	
41, 42 (2 boats)			87	10·8	6	1	33			..	..	10	
43, 44 (2 boats)			89	10·4	5·7	1	32			..	..	10	
47			87	10·8	5	1	33			..	..	10	
48			89	10·4	5·8	1	32			..	..	10	
50, 53 (2 boats)			87	10·8	5	1	32			..	..	10	
54, 55 (2 boats)			91	10	6·1	1	32			..	..	10	
VEDETTE BOATS—													
(1 boat) (aluminium) ..	Poplar ..	1894	62·3	9·1	..	1	14	210	20·5	..	1	8	
29, 30 (2 boats)	Chiswick ..	1876	67	8·5	3·5	1	16	..	18	..	1	8	
56, 57 (2 boats)	Chiswick ..	1879	59	7·5	3·5	1	12	50	16	..	1	8	
58, 59 (2 boats)	Chiswick ..	1881	63	7·5	3·5	1	11	50	17	..	1	8	
A–I (9 boats)	Creusot ..	1890–94	62·4	8·9	4·9	1	15	210	16·5	..	1	9	
SUBMARINE—													
Aigrette *	Toulon ..	Bldg.	117·6	12·5	8·3	1	172	..	10·5	..	..	..	..
Algérien	Cherbourg ..	1901	148·8	9·2	..	1	146	..	..	..	..	..	..
Alose	Toulon ..	Bldg.	77	7·6	8·0	1	68	..	8	..	..	5	..
Anguille	Toulon ..	Bldg.	77	7·6	8·0	1	68	..	8	..	..	5	..
Bonite	Toulon ..	Bldg.	77	7·6	8·0	1	68	..	8	..	..	5	..
Castor	Rochefort ..	1903	77	7·6	8·0	1	68	..	8	..	..	5	..
Cigogne*	Toulon ..	Bldg.	117·6	12·5	8·3	1	172	..	10·5	..	..	..	..

* Submersible boats, Laubeuf type.
The Libellule, a turbine-motor vedette torpedo boat, is in hand at Cherbourg.

France—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
SUBMARINE—*contd.*			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Dorade	Toulon	Bldg.	77	7·6	8·0	1	68	..	8	..	..	5	..
Espadon‡	Cherbourg	1901	111·6	12·0	5·4	1	106–206	250	8–12	..	2	11	..
Esturgeon	Toulon	1903	77	7·6	8·0	1	68	..	8	..	..	5	..
Farfadet	Rochefort	1901	135·8	9·5	9·5	1	185	..	9·12½	..	..	9	..
Français	Cherbourg	1900	148·8	9·2	..	1	146	..	..	..	..	..	..
Gnome	Rochefort	1901	135·8	9·5	9·5	1	185	..	9–12½	..	..	9	..
Grondin	Toulon	Bldg.	77	7·6	8·0	1	68	..	8	..	..	5	..
Gustave Zédé	Toulon	1893	159	12·4	..	1	266	720	8–12	..	1	8	..
Gymnote	Mourillon	1888	65·6	5·9	5·9	1	30	60	4–6	..	..	4	..
Korrigan	Rochefort	1901	135·8	9·5	9·5	1	185	..	9–12½	..	..	9	..
Loutre	Rochefort	1903	77	7·6	8·0	1	68	..	8	..	..	5	..
Ludion	Cherbourg	1902	77	7·6	8·0	1	68	..	8	..	..	5	..
Lutin	Rochefort	1903	135·8	9·5	9·5	1	185	..	9–12½	..	..	9	..
Lynx	Cherbourg	1902	77	7·6	8·0	1	68	..	8	..	..	5	..
Méduse	Rochefort	Bldg.	77	7·6	8·0	1	68	..	8	..	..	5	..
Morse	Cherbourg	1899	118	9·2	9·9	1	144	..	8–12·3	..	1	9	..
Naïade	Cherbourg	1902	77	7·6	8·0	1	68	..	8	..	..	5	..
Narval‡	Cherbourg	1899	111·6	12·0	5·4	1	106–206	250	8–12	..	2	11	..
Otarie	Rochefort	Bldg.	77	7·6	8·0	1	68	..	8	..	..	5	..
Oursin	Rochefort	Bldg.	77	7·6	8·0	1	68	..	8	..	..	5	..
Perle	Cherbourg	1903	77	7·6	8·0	1	68	..	8	..	..	5	..
Phoque	Rochefort	Bldg.	77	7·6	8·0	1	68	..	8	..	..	5	..
Protée	Cherbourg	1902	77	7·6	8·0	1	68	..	8	..	..	5	..
Silure‡	Cherbourg	1901	111·6	12·0	5·4	1	106–206	250	8–12	..	2	11	..
Sirène‡	Cherbourg	1901	111·6	12·0	5·4	1	106–206	250	8–12	..	2	11	..
Souffleur	Toulon	Bldg.	77	7·6	8·0	1	68	..	8	..	..	5	..
Thon	Toulon	Bldg.	77	7·6	8·0	1	68	..	8	..	..	5	..
Triton‡	Cherbourg	1901	111·6	12·0	5·4	1	106–206	250	8–12	..	2	11	..
Truite	Toulon	Bldg.	77	7·6	8·0	1	68	..	8	..	..	5	..
X ‡	Cherbourg	Bldg.	121·6	10·6	7·6	2	168	..	10½	..	..	..	..
Y ‡	Rochefort	Bldg.	135·8	9·8	..	..	202	..	11	..	..	..	..
Z ‡	Toulon	Bldg.	142·8	9·9	..	..	213	..	11	..	..	..	..
Omega	..	Pro.	160·6	13·9	9·0	2	301	..	11	..	2	20	..

‡ Submersible boats. Thirty-one submarine or submersible boats, Q 38 to Q 68, were in the list of new constructions, 1902, as part of the programme. Of these 19 will be put in hand in 1903, including the Omega.

Germany.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
D 1, D 2 (2 boats)	Elbing	1887	180·6	21·6	9·8	2	250	1,800	19	6 1-pr. revs.	3	48	50
D 3, D 4 (2 boats)	Elbing	1888	184	21·8	9·6	2	300	2,000	20	4 6-pr. Q.F. 2 1-pr. revs.	3	48	90
D 5, D 6 (2 boats)	Elbing	1888–9	190·3	23	9·6	2	320	3,000	22½	4 6-pr. Q.F. 2 1-pr. revs.	3	48	90
D 7, D 8 (2 boats)	Elbing	1890	190·3	23	9·9	2	350	3,500	22¼	6 Q.F.	3		
D 9	Elbing	1894	197·0	24·3	9·9	2	380	4,500	26	6 Q.F.	3		
D 10	Chiswick	1898	211·9	19·6	8·1	2	310	5,800	28·5	5 3-pr. Q.F.	3	52	80
D 11, D 12	Chiswick	1900	218·6	20·9	8·7	2	333	7,000	31	1·12 pr. 5·6 prs.	2	59	40
S 90–101	Elbing	1900	206·8	22	8·9	2	350	6,000	27·5	3 3-pr. Q.F.	3		
S. 102–107	Elbing	1901	206·8	22	8·9	2	350	6,000	27·5	3 3-pr. Q.F.	3		
G 108–113	Kiel (Germania)	1901-2	207·7	22	8·9	2	350	6,000	29·2	3 3-pr. Q.F.	3	49	100
S 114–119	Elbing	Bldg.	207·7	22	8·9	2	350	6,000	29·2	3 3-pr. Q.F.	3	49	100
Taku *	Elbing	1895	193·7	21·0	..	2	250	6,000	35	6·3 prs.	2	..	67
FIRST CLASS—													
S 1—S 40 (40 boats) / S 43—S 65 (23 boats)	Elbing / Elbing	1883–92	121 / 150	15·7 / 15·6	6·7 / 6·7	..	85–88	900 / 1,600	20–22½	2 1-pr. revs.	2	..	17
S 66—S 73 (8 boats)	Elbing	1893	154·3	16·4	..	2	110 / 145	1,600	..	..	3		
S 74—S 81 (8 boats)	Elbing	1894	154·3	16·4	..	2	125	1,900	25	..	3		
S 82—S 87 (6 boats)	Elbing	1897–8	158·2	16·9	9·0	2	140	2,300	26	2 1-pr. revs.	3	..	32
G 88—G 89 (2 boats)	Kiel (Germania)	1898	154·3	16·5	..	..	160	2,500	26	2 mach.	3	22	
V 1, V 2 (2 boats)	Stettin	1884	124·6	..	..	..	75 / 90	550 / 1,000	..	..	2		
V 3, V 4 (2 boats)	Stettin	1884	..	..	..	..			..	..	2		
V 5—V 10 (6 boats)	Stettin	1884	..	..	..	..			19	..	2		
G 1,	Gaarden	1885	124·6	15·7	6·6	..	88	1,000	19	2 1-pr. revs.	2	17	
Y 1,	Poplar	1884	120	12·5	5·5	1	65	650	19	2 1-pr. revs.	2	15	25
T 1, T 2 (2 boats)	Chiswick, &c.	1884	117·7	12·5	6·2	1	80	..	20	2 1-pr. revs.	2	15	22
H 1,	Kiel (Howaldt)	1886	..	..	..	..	80	1,000	20·2	2 1-pr. revs.	2		
K 1,	Kiel (Dockyard)	1887	118·1	13·4	5·9	..	85	1,000	22	2 1-pr. revs.	..	18	
SECOND CLASS—													
3 boats	..	1893	..	..	..	..	88	..	22				
2 boats	..	1893	..	..	..	..	90	..	3				

* Ex Hai Ying, captured from the Chinese at Taku, 1900.

The Estimates of 1903 provide the initial expenditure for the building of a division of torpedo boats.

A submarine boat of the Holland type is in hand, and another of special type is to be built at Kiel.

Greece.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
6 boats	Stettin ..	1885	128	15·3	5·4	1	85	1,050	19	4 1-pr. revs.	..	20	20
6 boats	Poplar.. ..	1881	100	12	4·2	1	48	600	19	2 1-pr. revs.	2	12	9
4 boats	La Seyne ..	1880	72	13	5·5	1	52	225	..	..	..	..	10
5 boats	La Seyne ..	1881	89	11	3·1	1	35	500	17·5	..	..	..	5

Italy.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Fulmine	Sestri (Odero)	1898	200	20·4	5·4	2	298	4,800	28	1 12-pr. 3 6-pr. Q.F.	3	43	60
Lampo, Freccia, Dardo, Strale, Euro, Ostro	Elbing (Schichau)	1899 1901	196·8	21·3	5·8	2	320	6,000	30	1 12-pr. Q.F., 5 6-pr.	2	53	60
Nembo, Turbine, Aquilone, Borea, Meteoro, Tuono	Naples (Pattison)	1901 1902	208	19·4	6·3	2	330	6,000	30	1 12-pr. Q.F., 5 6-pr.	2	53	60
Zefiro, Espero	..	Bldg.	208	19·4	6·3	2	330	6,000	30	1 12-pr. Q.F., 5 6-pr.	2	53	60
FIRST CLASS—													
5 boats (Aquila, Sparviero, Nibbio, Avvoltoio, Falco)	Elbing ..	1888	152	17·2	7·9	2	130	2,200	26·6	2 3-pr. Q.F., 1 1-pr. Q.F., 1 1-pr. rev.	3	24	40
Nos. 78, 79 (2 boats)	Venice ..	1887	135	14	5·3	2	110	1,600	24	1 1-pr. Q.F., 1 1-pr. rev.	3	20	24
Pellicano	Sestri (Odero)	1899	157·4	19	14·8	2	147	2,700	25	2 3-prs.	2	28	24
Condore	Sestri (Ansaldo)	1898	154·3	16·8	6·9	2	136	2,500	27	2 3-prs.	2	27	16
SECOND CLASS—													
Nos. 76, 77 (2 boats)	Poplar.. ..	1887	140	14	5	2	100	1,600	25	2 3-pr. Q.F., 1 1-pr. rev.	4	20	24
Nos. 78, 79 (2 boats)	Venice ..	1896	..	..	..	..	..	..	..	..	3	20	24
Nos. 80–104, 106–111 (31 boats)	Elbing and Italy ..	1887–88	127·7	15·6	6·8	1	85	1,000	22·5	2 1-pr. Q.F	2	17	17
Nos. 112-116, 118-135 (23 boats)	Elbing and Italy ..	1889–92	127·7	15·6	6·8	1	85	1,100 1,200	23	..	2	17	17
No. 117	..	1895	131·2	16·4	..	1	85	1,000	..	2 1 pr. Q.F.	2	17	17
Nos. 136–146 (11 boats)	Italy	1893–94	131·2	16·4	..	1	85	1,000	22	2 1-pr Q.F.	2	17	17
Nos. 147–153 (7 boats)	Italy ..	1894–5	131·2	16·4	..	1	85	1,000	22	2 1-pr. Q.F.	2	17	17
Nos. 60–75 (15 boats)	Elbing and Italy ..	1885–87	127·7	15·6	6·8	1	65	1,000	22·5	2 1-pr. Q.F.	2	17	17
THIRD CLASS—													
No. 22	Poplar.. ..	1882	100	12·5	5·5	1	40	620	22	1 1-pr. rev.	2	11	7
No. 25	Poplar.. ..	1882	100	12·5	5·5	1	40	620	22	1 1 pr. rev.	2	11	7
Nos. 26–59 (34 boats)	Chiswick and Italy ..	1882–86	100	11·7	5·3	1	34	430	21·3	1 1-pr rev.	2	11	7
Nos. 23, 24 (2 boats)	Chiswick ..	1881	92	10·5	4·9	1	33	470	21·8	1 1-pr. rev.	2	11	7
FOURTH CLASS.													
No. 1	Chiswick ..	1878	78·8	9·8	3	1	19	173	19	..	2	10	
No. 2	Poplar.. ..	1879	86	11	4·5	1	25	420	21	1 1-pr. rev.	2	10	
No. 18	Chiswick ..	1883	62·4	7·5	2·5	1	10	170	17	1 1-pr. rev.	2	10	
No. 11	Leghorn ..	1883	75·6	9·9	3·8	1	31	250	19·2	..	2	10	
SUBMARINE—													
Delfino	Spezia	1895	79·2	9·1	..	..	95	..	10·0	1 1-pr. rev.	2	8	
Tritone	Spezia	1902	55·9				107						

The new Italian destroyers have Thornycroft water-tube boilers.

The submersible boat, Glauco, is in hand at Venice, to have a surface speed of 14 knots and a range of 2,000 miles. Another boat of the type is to be built.

Japan.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Murakumo	Chiswick ..	1898											
Shinonome	Chiswick ..	1898											
Yugiri	Chiswick ..	1898							30 to 30·55	1 12-pr., 5 6-prs.			
Shiranui	Chiswick ..	1899	210·0	19·5	7·2	2	285	5,800			2	54	80
Kagerou	Chiswick ..	1899											
Usugumo	Chiswick ..	1900											
Shirakumo	Chiswick ..	1901	216·7	20·7	8·3	2	..	7,400	31	1 12-pr., 5 6-prs.	2	59	96
Asashio	Chiswick ..	1902											
Ikadsuchi	Poplar.. ..	1898							31·03 to 31·38				
Inadsuma	Poplar.. ..	1899	220·0	20 6	9·6	2	400	6,000		1 12-pr., 5 6-prs.	2	55	95
Akebono	Poplar.. ..	1899											
Sazanami	Poplar.. ..	1899											
Oboro	Poplar.. ..	1899	220·3	20·6	9·6	2	307	6,000	31 62	1 12-pr., 5 6-prs.	2	..	90
Niji	Poplar.. ..	1899	220·3	20.6	9·6	2	308	6,000	31 15	1 12-pr., 5 6-prs.	2	..	90
Kasumi .. .. .. / Akatsuki	Poplar.. ..	1902	220·3	20·6	9·6	2	320	6,000	31	1 12-pr., 5 6-prs.	2	..	..
Harusame	Yokosuka ..												
Murasame	Yokosuka ..	Bl'g.	220·3	20·6	9·6	2	320	6,000	31	1 12-pr., 5 6-prs.	2	..	..
Hayatori	Yokosuka ..												
Asagiri	Yokosuka ..												
FIRST CLASS—												..	
Kotaka	Poplar.. ..	1886	170	19·6	5		190	1,400	19	4 mach.	6		
Hayabusa	Normand ..	1898											
Kasasagi	Normand ..	1899	147·7	16·0	8 2	2	150	4,200	30	3 3-prs.	3		13
Manadzuru	Normand ..	1899											
Chidori	Normand ..	1900											
Shirataka	Elbing ..	1899	..	..	..	..	125	..	28	..	..	..	..
Aoataka	Kure	Bldg.	..	..	..	..	120	..	..	..	..	..	..
Hato	Kure	Bldg.	..	..	..	..	120	..	..	..	..	..	..
Hibari	Kure	Bldg.	..	..	..	..	120	..	..	..	..	..	..
Kari	Kure	Bldg.	..	..	..	..	120	..	..	..	..	..	..
Kiji	Kure	Bldg.	..	..	..	..	120	..	..	..	..	..	..
Tsubame	Kure	Bldg.	..	..	..	..	120	..	..	..	..	..	..
Hashitaka	Kawasaki ..	Bldg.	..	..	..	..	150	..	..	..	..	..	..
Kamone	Kure	Bldg.	..	..	..	..	150	..	..	..	..	..	..
Otori	Kawasaki ..	Bldg.	..	..	..	..	150	..	..	..	..	..	..
Sagi	Kure	Bldg.	..	..	..	..	150	..	..	..	..	..	..
Uzuri	Kure	Bldg.	..	..	..	..	150	..	..	..	..	..	..
Fukuriu	Kiel	1895	..	..	..	..	115	..	..	..	..	..	..
SECOND CLASS—													
2 boats*	Kobe	1901	..	..	..	..	83	..	..	..	..	..	..
10 boats	Poplar.. ..	1900	152·6	15·3	7·9	..	..	1900	27	2 3-prs	3	..	36
16 boats	Elbing ..	1891–9	..	..	..	..	..	..	..	..	..	..	..
13 boats	Creusot ..	1889	114·7	10·6	6	2	56	525	20	2 1-prs.	..	16	50
7 boats	Kobe	1889	114·7	10·6	6	1	56	525	20	2 1-prs.	..	16	
4 boats	Poplar.. ..	1879	100	12·5	..	1	40	620	20	..	..	..	
1 boat (No. 24) ..	Normand ..	1891	118	13·1	6·9	1	80	1,200	23	2 1-prs.	2	21	10
2 boats	Normand ..	1898	121·4	13·6	8·6	1	86	1,800	27	1 3-pr.	2	..	10

* Materials sent out by Schichau (Nos. 60 and 61).

Mexico.

Mexico has four first-class boats building or projected.

Norway.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity
FIRST CLASS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons
Lyn	..	1882	94·2	9·7	2·5	1	36	430	18	..	1	..	3
Od	..	1882	97·5	11	5·6	1	40	450	18	..	1	..	3
Orm, Otter (2 boats)	..	1887	108·2	12·2	5·6	1	40	500	20	..	2	..	3
Pil, Rask (2 boats)..	..	1887	101·7	11·8	5·6	1	40	500	20	..	2	..	3
Snar	..	1887	104·9	11·8	5·6	1	40	500	20	..	2	..	3
Springer	..	1887	97·5	11·6	5·6	1	40	450	19	..	2	..	3
Varg (8), Raket (9)	Christiania..	1894	111·5	12·4	..	1	43	..	..	..	2	..	..
Hval, Delfin, Hai (3 boats)	Elbing ..	1896	128·0	15·0	6·9	1	84	1,100	24·5	2 1·4-in. Q.F.	2	..	..
Storm, Brand, Trods	Christiania ..	1899	128·0	15·0	..	1	84	1,100	23	2 1·4-in. Q.F.	2		
Laks, Sild, Sael, Skrei	Christiana ..	1900	128·0	15·0	6·9	1	84	11,000	23	2 1·4-in.	2	..	..
Kjeck, Hvas, Dristig, Kvik, Djerv, Blink, Glint	Christiana ..	1898 1900	111·5	14·5	6·3	1	65	650	19	2 1·4-in.	2	..	..
SECOND CLASS—													
Rasp	Chiswick ..	1873	58	7·5	3·9	1	16	..	18	..	2		
Ulven	..	1878	56	..	..	1	16	..	9	..	sp.		
2 boats	..	Bldg.	..	..	..	..	20	..	12	..	..		

A submarine boat of the Holland type is to be bought.

Netherlands.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
FIRST CLASS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Ardjoeno	Poplar.. ..	1886	125	13	6	1	83	80	21	2 1-prs.	2	16	10
Batok	Amsterdam	1887	125	13	6·9	1	83	725	20	2 1-prs.	2	16	10
Cycloop	Amsterdam	1887	125	13	6·9	1	83	680	20	2 1-prs.	2	16	10
Dempo	Amsterdam	1887	125	13	6·9	1	83	760	20	2 1-prs.	2	16	10
Empong	Poplar.. ..	1888	128	13	6·2	1	91	1,100	24·1	2 1-prs.	3	16	15
Etna	Poplar.. ..	1882	100	12·6	5 6	1	45	550	21·5	2 1-prs.	2	16	7
Foka	Amsterdam	1888	128	13	6·2	1	90	1,000	22·1	2 1-prs.	3		
Goentoer	Amsterdam	1888	128	13	6·2	1	90	950	21	2 1-prs.	3		
Habang	Amsterdam	1888	128	13	6·2	1	90	930	21·7	2 1-prs.	3		
Hekla	Poplar.. ..	1882	100	12·6	5·6	1	45	550	21·5	2 1-prs.	2	16	7
Idjen	Amsterdam	1889	128	13	6·2	1	90	840	20·6	2 1-prs.	3		
Krakatau	Amsterdam	1889	128	13	6·2	1	90	750	19·1	2 1-prs.	3		
Lamongan	Amsterdam	1890	104·5	13·3	5·2	1	50	790	20·7	2 1-prs.	2		
Makjan	Amsterdam	1890	104·5	13·3	5·2	1	50	790	20·7	2 1-prs.	2		
Nobo	Amsterdam	1890	104·5	13·3	5·2	1	50	790	20·7	2 1-prs.	2		
Scylla	Poplar.. ..	1900	130	13·6	6·0	1	77	1,200	24.3	2 1-prs.	3	18	20
Hydra	Poplar.. ..	1900	130	13 6	6·0	1	77	1,200	24 4	2 1 prs.	3	18	20
Ophir	Poplar.. ..	1901	152·6	15·3	7 9	1	130	1,900	27	2 3-prs.	2	25	36
Pangrango	Poplar.. ..	1901	152·6	15·3	7 9	1	130	1,900	27	2 3-prs.	2	25	36
Rindjani	Poplar.. ..	1901	152·6	15·3	7·9	1	130	1,900	27	2 3-prs.	2	25	36
Smeroe	Fijenoord ..	Bldg.	152·6	15·3	7 9	1	130	1,900	27	2 3-prs.	2	25	36
Tangka	Fijenoord ..	Bldg.	152 6	15·3	7·9	1	130	1,900	27	2 3-prs.	2	25	36
Wajang	Fijenoord ..	Bldg.	152·6	15·3	7 9	1	130	1,900	27	2 3-prs.	2	25	36
Minotaurus, Python,	Flushing ..	Bldg.	152·6	15·3	7·9	1	130	1,900	27	2 3-prs.	2	25	36
2 others	Flushing ..	1 ro.	152·6	15 3	7·9	1	130	1,900	27	2 3-prs.	2	25	36
SECOND CLASS—													
Nos. 1, 2, 4–20 (19 boats)	Chiswick, etc.	1878–86	76 / 79	10·3	5·2	1	29	250	18	1 1-pr.	2 sp	..	3
Nos. 3,21,2 (3 boats)	..	1890	83·6	10·5	5·1	1	37	460	17·9	1 1-pr.	1	..	3
1 boat	East Cowes	1883	45·5	9·7	..	1	..	..	12	1 mach.	1		
INDIAN FLEET—													
Cerberus	Flushing ..	1888	125	13	6·9	1	83	912	21·2	2-1 prs.	..	16	
1 boat	..	1891											
3 boats	..	1893–94	125	..	..	..	83	..	21·5	..	2		

All the Poplar destroyers have Yarrow water-tube boilers, and the later ones are fitted for the consumption of oil fuel.
One submarine boat (Holland type) to be purchased.

Portugal.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
5 boats (5–9)	Elbing ..	1890–92											
Espadarte (1)	Poplar.. ..	1881	86	11	5	1	31	450	19·7	2 mach.	2	10	10
Nos. 2, 3, 4 (3 boats)	Poplar.. ..	1886	120	12·5	5·5	1	60	700	20	2 mach.	2	16	18
Fulminante	Blackwall ..	1880	75	15	2·6	2	40	150	11·5	2 mach.	..	..	8
Mineiro	Lisbon ..	1893	..	..	..	..	..	..	12				
SUBMARINE—													
Plongeur	..	1892	72·1	11·5	..	..	..	..	6				

Roumania.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
FIRST CLASS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons
Naluka	Havre	1888	120·7	11·3	6·9	1	56	578	21	1 1-pr. rev.	2	..	12
Sborul	Havre	1888	120·7	11·3	6·9	1	56	578	21	1 1-pr. rev.	2	..	12
Smeul	Havre	1888	120·7	11·3	6·9	1	56	578	21	1 1-pr. rev.	2	..	12
SECOND CLASS—													
Soimul	Poplar.. ..	1882	63	8	3	1	12	150	16·5	..	..	8	1
Vulturul	Poplar.. ..	1882	63	8	3	1	12	150	16·5	..	..	8	1

Russia.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
BALTIC SEA.													
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Prytki	Poplar.. ..	1895	190	18·6	7.0	2	240	4,400	29.7	1 12-pr. 3	2		
Revy, Retivy, Ryany, Rezviyi, Prosorlivy, Piliky, Poslu-ny, Prostny, Poratsaius-chy, Prontsiteliny, Podvitsny	Abo, Ishora & Nevsky ..	1898	196·9	18·4	11·5	1	240	3,800	27	1 12-pr, 3 3-pr	2	55	53
Buistoi, Bedovi, Bravi, Blestiaschy, Bezumpre bni, Bodry Bystri, Vidny ..	Nevsky and Ishora ..	1900–2 & Bldg.	196·9	18·4	11·5	1	350	6,000	28	1 12-pr, 5 3-pr			
FIRST CLASS—													
Aspen	Ishora.. ..	1895	127·9	15·7	6·9	1	98	1,250	21	..	2	..	17
Abo	Elbing ..	1886	128	15·7	7·5	1	87	900	22·2	4 1-pr. revs.	2	13	17
Bjerke	Putiloff ..	1890	136·5	13	7·8	..	81	1,100	21				
Dago	Abo	1891	152	13	8·3	..	100	1,000	19				
Domeness	Putiloff ..	1895	127 9	15·7	6·9	1	98	1,250	21	..	2	..	17
Eckness	Abo	1890	136·5	13	7·8	..	81	1,100	21				
Hapsal	Putiloff ..	1891	126	13	8·5	1	81	1,100	21	2 1-pr. revs.	2	13	
Hogland	Ishora.. ..	1894	128	16	6·9	1	85	1,200	22	2 1-prs.	2	13	17
Kotka	Abo	1891	152	13	8·3	..	100	1,000	19				
Kotlinj	St. Petersburg	1885	124·2	12·9	5·9	2	67	500	16·5	2 1-pr. revs.	2	16	15
Kronschlot	Ishora.. ..	1891	152	13	8·3	..	100	1,000	19				
Lachta	Elbing ..	1886	128	15·7	7·5	1	87	900	20	4 1-pr. revs.	2	13	17
Libawa	Elbing ..	1886	128	15·7	7·5	1	87	1,000	22	4 1-pr. revs.	2	13	17
Louga	Elbing ..	1886	128	15·7	7·5	1	87	900	20	4 1-pr. revs.	2	13	17
Moonsund	Putiloff ..	1891	126	13	8·5	1	81	1,100	21	2 1-pr. revs.	2	13	
Nargen	Ishora.. ..	1894	128	16	6·9	1	85	1,200	22	2 1-prs.	2	13	17
Narwa	Elbing ..	1886	128	15·7	7·5	1	87	900	20	4 1-pr. revs.	2	13	17
Pernoff	Normand ..	1892	137·9	14·9	6·8	2	120	1,600	25	2 3-prs.	2	26	16
Rochensalm	Putiloff ..	1890	136·5	13	7·8	..	81	1,100	21				
Seskar	Ishora.. ..	1891	152	13	8·3	..	100	1,000	19				
Sestoretsk..	Normand ..	1894	118	13·2	8·6	1	80	1,300	24	2 1-prs.	2	21	10
Tosna	Putiloff ..	1893	127·9	15·7	6·9	1	98	1,250	21	..	2	13	17
Transund..	Ishora.. ..	1895	127·9	15·7	6·9	1	98	1,250	21	..	2	..	17
Viborg	Clydebank..	1886	144·5	17	8·1	2	126	1,400	20	2 3-pr. revs.	3	24	45*
Vindawa	Elbing ..	1886	128	15·7	7·5	1	87	900	21	4 1-pr. revs.	2	13	17
Vzriw	St. Petersburg	1877	118	16	10·9	1	160	800	14·5	4 Q.F.	1	18	16
8 boats	St. Petersburg	1894	128	16	6·9	1	85	1,200	22	2 1-prs.	2	13	17
2 boats	Putiloff ..	1894	138	14·7	9·9	2	118	..	25	2 mach.	2	26	
2 boats	St. Petersburg	1896	128	16	6·9	2	85	1,200	22	2 1-prs.	2	13	17
6 boats	St. Petersburg	1897	138	14·7	9·9	2	120	..	25	..	2	26	
†8 boats	Nevsky ..	1898	..	..	..	..	118						
Akula, Buichok	Nevsky and Ochta ..	1901	147·8	13 0	..	2	150	4,200	25	2 1-prs.	1		
Makrel, Nalim, Okun, Plotva, Peskar, Keta, Paltus, Sig	Nevsky and Ochta ..	Bldg.	147·8	13·0	..	2	150	4,200	25	2 1-prs.	1		
SECOND CLASS—													
21 boats (Galka class)	Elbing and Russia ..	1880 &c.	74·7	8·9	5	1	30	220	16	..	2	14	3
21 boats (Woron class)	Elbing and Russia ..	..	66	11·1	..	1	..	260	17				
1 boat	Poplar.. ..	1888	60	8·5	3	1	16	240	17·5	..	2	..	1
BLACK SEA.													
DESTROYERS—													
Zavidni, Zavetni, Zharki, Zhutki, Zhivci, Zhivulka	Nicolaieff ..	Bldg.	210	21·2	7	2	350	5,500	27	1 12-pr, 5 3-pr	2		
Stremitelni, Strogi, Smetlivy, Svirepy**	Abo	1901	190·4	18·5	11·5	2	240	3,800	27	1 12-pr, 3 3-pr	2	..	60
FIRST CLASS—													
A. B. C. (3 boats) ..	Nicolaieff ..	1893	126	..	..	..	81	..	21				
Adler..	Elbing ..	1890	152·0	17·2	7·9	2	130	2,200	27·4	2 1-prs.	3	24	40
Anakria	Elbing ..	1890	128·0	16	6·9	1	85	1,200	22	2 1-prs.	2	13	17
Anapa	Odessa.. ..	1891	126	13	8·5	1	81	1,100	21	2 1-pr. revs.	2	13	
Aitodorj	Odessa.. ..	1891	126	13	8·5	1	81	1,100	21	2 1-pr. revs.	2	13	
Batoum	Poplar.. ..	1880	100	12·5	5·5	1	40	500	22	2 1-pr. revs.	2	12	9
D. E. (2 boats) ..	Sebastopol ..	1893	128	..	..	..	85	..	22				
Gagri	Claparède ..	1883	120·6	13·3	7	1	78	600	18	2 1-pr. revs.	2	13	12
Gelendshik	La Seyne ..	1883	122·7	12·4	6·2	1	73	560	18	2 1-pr. revs.	2	13	11
Ismail	Nicolaieff ..	1886	128	15·7	7·5	1	87	900	20	2 1-pr. revs.	2	13	17
Itzvar	Odessa.. ..	1891	..	..	..	..	81	1,100					
Kodor	Elbing ..	1886	128	15·7	7·5	1	87	900	21	4 1-pr. revs.	2	13	17
Kilia..	Elbing ..	1886	128	15·7	7·5	1	87	900	22	4 1-pr. revs.	2	13	17
Novorossisk	Elbing ..	1886	128	15·7	7·5	1	87	900	22	4 1-pr revs.	2	13	17
Poti	Normand ..	1883	124·8	11·0	7·0	1	62	550	18	2 1-pr. revs.	2	13	10
Reni	Elbing ..	1886	128	15·7	7·5	1	87	900	22	4 1-pr. revs.	2	13	17
Sookhoum	Chiswick ..	1883	113	12·5	6	1	64	700	19.5	2 Nords.	2	13	10
Tchardak..	Elbing ..	1886	128	15·7	7·5	1	87	900	20	4 1-pr. revs.	2	13	17
Yalta..	Elbing ..	1886	128	15·7	7·5	1	87	900	22	4 1-pr. revs.	2	13	17
3 boats	Elbing ..	1886	128	15·7	7·5	1	87	900	22	4 1-pr. revs.	2	13	17
4 boats	Nicolaieff ..	Bldg.	..	..	..	..	..	..	..	..	..	..	..

* Has received liquid fuel apparatus. † Pernoff type. ‡ Captured from the Chinese at Taku, 1900.

** These destroyers proceeded from Cronstadt to Sebastopol, unarmed, January, 1903, passing the Dardanelles by consent of the Porte. Other destroyers of the type are to be built at Sebastopol and Nicolaieff.

A submarine boat from the plans of Lieut. Kolbasieff and Engineer Kuleinikoff has begun her trials, and has received the name of Matros Piotr Koschka.

Russia—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
			Length.	Beam.	Draught.								
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
BLACK SEA—*contd.*													
SECOND CLASS—													
Istcheritza	Sebastopol ..	1878	62·3	9·7	3·9	1	24	220	15	..	..	10	
Karabin	Elbing.. ..	1877	64·3	8·4	2	1	11	120	15	..	..	8	
Kefal..	Chiswick ..	1880	60·5	7·5	3·5	1	..	..	16·8	..	..	8	
Scheglensk	Sebastopol ..	1878	59·3	9·5	3·9	1	24	220	15	..	..	10	
Schehouka	Sebastopol ..	1878	59·3	9·5	3·9	1	24	220	15	..	..	10	
Scoombia	Odessa.. ..	1878	61·3	10	4	1	25	220	15	..	..	10	
Soroka	St. Petersburg	1878	62·3	9·7	3·9	1	24	220	15	..	..	10	
Soulin	..	1877	60	9·7	3·9	1	24	210	15	..	..	10	
Sultanka	Odessa.. ..	1878	64·3	10	4	1	25	220	15	..	..	10	
1 boat	Poplar	1877	75	10	..	..	..	..	..	..	..	..	
60 boats (Woron Class)	Elbing, etc.	..	66	11·1	..	1	..	260	17				
3 boats	Nicolaieff ..	1898											
FAR EAST.													
DESTROYERS—													
Bditelni, Bespochtchadni, Bestrachni, Beschumni (4 boats)	Elbing ..	1899	196·9	18·4	11·5	1	350	6,000	27	1 12-pr, 5 3-pr	2		
Boevoi	Birkenhead	1899	213	21·5	12·9	1	370	6,000	28				
Grozovoi, Vlastni ..	Havre (F. & C.)	1900–2	186·0	20·8	10·3	2	300	5,000	28	1 12-pr 5 3-pr	2	..	80
Boiki, Burni	Nevsky and Ishora ..	1900–2 & Bldg.	196·9	18·4	11·5	1	350	6,000	28	1 12-pr, 5 3-pr			
Vnushitelni	Havre (F.&C.	1900–2	186·0	20·8	10·3	2	300	5,000	27	1 12-pr, 5 3-pr	2	..	60
Vnimatelni, Vuinoslivni	Havre (Normand) ..	1900–1	186·0	20·8	10·3	2	300	5,000	27	1 12-pr, 5 3-pr	2	..	80
Silni, Serdity, Smely, Storosevoi, Steregustchi, Skory, Strashni, Stroini, Strashni, Riesitelini, Ratsiastchi, Ratstoropny*	..	1902 & Bldg.	190·3	18·9	11·6	2	350	3,800	26	1 12-pr, 3 3-pr	2	..	..
‡Lieut. Burukoff ..	Elbing ..	1898	193·7	21·0	..	2	280	6,000	35	6 3-pr. Q.F.	2	..	67
Borgo	Abo	1890	136·5	13	7·8	..	81	1,100	21				
Forel..	..	..	71·5	6·5	3·3	1	23	220	16				
Jantchiche	Elbing.. ..	1887	128	15·7	11·5	..	87	970	19	4 1-pr. revs.	2	13	17
N.	..	1893	152·5	16·8	..	..	140	2,200	26·5	2 1-pr. revs.	3	24	40
N.	..	1893	152·5	16·8	..	..	140	2,200	26·5	2 1-pr. revs.	3	24	40
Podorosnik	..	..	71·5	6·5	3·3	1	23	220	16				
Revel	Normand ..	1886	151	12·5	8·4	1	102	800	20	2 1-pr. revs.	2	23	15
Sisik	..	..	71·5	6·5	3·3	1	23	220	16				
Skorpion	..	..	71·5	6·5	3·3	1	23	220	16				
Sootchena	Elbing.. ..	1887	128	15·7	11·5	..	87	970	19	4 1-pr. revs.	2	13	17
Sterliad	..	..	71·5	6·5	3·3	1	23	220	16				
Strauss	..	..	71·5	6·5	3·3	1	23	220	16				
Sunguri (*ex* Hogland)	Abo	1890	152	16	7·9	2	140	1,800	22				
Sweaborg	Normand ..	1886	151	12·5	8·4	1	102	800	20	2 1-pr. revs.	2	23	15
Ussuri (*ex* Nargen)	Abo	1890	152	16	7·9	2	140	1,800	22				
2 Unnamed	Ochtenski ..	Bldg.	152	16	7·9	2	140	1,800	22				

Three or more destroyers of the Boevoi type are in hand at Port Arthur.

* Some of these destroyers are understood to be still in hand on the Neva. All are for the Far East.

Spain.

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
			Length.	Beam.	Draught.								
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
DESTROYERS—													
Terror	Clydebank ..	1896	220	22	5·6	2	300	6,000	28	2 12-pr. 2 6-pr. 2 1-pr.	2	67	100
Audaz, Osado, Proserpina	Clydebank ..	1897	225	25·6	5·8	2	400	7,500	30	2 14-pr. 2 6-pr. 2 1-pr.	2	70	90
FIRST CLASS—													
Acevedo	Chiswick ..	1885	117·7	12·5	6·2	1	63	660	20·1	2 mach.	2		
Arriete	Chiswick ..	1887	147·5	14·6	4·9	2	97	1,600	26·1	4 3-pr. Q.F.	2	..	25
Azor	Poplar.. ..	1887	134·5	14	6	1	108	1,600	24	4 3-pr. Q.F.	3	23	25
Bustamente	Normand ..	1887	126	10·9	..	..	63	800	..	3 3-prs.	2		
Habana	Chiswick ..	1887	127·5	12·5	6	1	59	730	21·3	1 mach.	2		
Halcón	Poplar.. ..	1887	134·5	14	..	1	108	1,600	24	4 3-pr. Q.F.	3	23	25
Julian Ordoñez ..	Chiswick ..	1885	117·7	12·5	6·2	1	65	660	20·1	2 1-in. Nord.	2		
Orion..	Gaarden ..	1885	125	15·5	3·5	1	85	1,000	21·5	2 1-pr. revs.	2	18	16
Rayo..	Chiswick ..	1887	147·5	14·6	4·9	2	97	1,600	25·5	4 3-pr. Q.F.	2	..	25
Barceto	..	1886	117·7	12·5	6·2	1	63	660	20	2 mach.	2		
VEDETTE BOATS—													
3 boats	East Cowes	1892	60	9·3	..	..	..	..	18·3				
SUBMARINE—													
Peral..	Carraca ..	1889	70	8·5	..	2	87	60	10				

Sweden.

TORPEDO BOATS.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
DESTROYER—													
Mode	Poplar.. ..	1902	220·3	20 6	8·9	2	400	6,830	32·4	1 12-pr. 5 6-prs.	2	55	95
FIRST CLASS—													
Komet	Elbing ..	1896	128	15·9	6·11	1	92	1,056	23·0	2 1·9-in. Q.F.	2	16	17
Blixt..	Carlskrona..	1898	128	15·9	6·11	1	92	1,260	23·5	2 1·9 in Q.F.	2	18	17
Meteor	Carlskrona..	1899	128	15·9	6·11	1	92	1,330	23·8	2 1·9-in. Q.F	2	18	17
Stjerna	Carlskrona..	1899	128	15·9	6·11	1	92	1,250	23·4	2 1·9-in. Q.F.	2	18	17
Orkan	Carlskrona..	1900	128	15·9	6·11	1	92	1,250	23·5	2 1·5 in. Q.F.	2	18	17
Vind..	Carlskrona..	1900	128	15·9	6·11	1	92	1,250	23·5	2 1·5-in. Q.F.	2	18	17
Bris	Carlskrona..	1900	128	15·9	6·11	1	92	1,250	23 5	2 1·5-in. Q.F.	2	18	17
Virgo	Carlskrona..	1902	128	15·9	6·11	1	92	1,250	23·5	2 1·5-in. Q.F.	2	18	17
Mira..	Carlskrona..	1902	128	15·9	6·11	1	92	1,250	23 5	2 1·5-in. Q.F.	2	18	17
Orion .. .. .. / Sirius .. .. .. / Capella	Carlskrona..	Bldg.	128	15·9	6·11	1	92	1,250		2 1·5-in. Q.F.	2	18	17
No. 1..	Chiswick ..	1884	113·2	12·2	6·3	1	65	620	18·5	1 mach.	2	16	11
2 boats (3 and 5) ..	Stockholm ..	1887	114·2	12·6	6·7	1	67	620	18·5	1 mach.	2	16	15
No. 7..	Stockholm ..	1887	114·2	12·6	6·7	1	67	620	18·7	1 mach.	2	16	15
2 boats (9 and 11) ..	Carlskrona..	1894	126·8	13·11	7·7	1	86	850	19·5	2 mach.	2	16	15
SECOND CLASS—													
No. 61	Stockholm ..	1882	91·6	11·8	5·7	1	40	350	16·0	1 mach.	1	14	9
No. 63	Chiswick ..	1883	100·1	11·10	5·11	1	45	420	19·0	1 mach.	2	14	7
No. 65	Stockholm ..	1885	100·1	11·10	5·11	1	45	420	19·0	1 mach.	2	14	9
No. 67	Stockholm ..	1886	100·9	11·10	6·1	1	46	430	19.2	1 mach.	2	14	9
No. 69	Stockholm ..	1886	100·9	11·10	6·1	1	46	450	19·9	1 mach.	2	14	9
No. 71	Stockholm ..	1887	103·4	11·10	6·7	1	58	460	18·6	1 mach.	2	14	9
No 73	Stockholm ..	1887	103·4	11·10	6·7	1	58	460	18·6	1 mach.	2	14	9
No. 75	Stockholm ..	1892	100·5	11·6	6·3	1	49	460	18·9	1 mach.	2	14	9
No. 77	Carlskrona..	1891	100·5	11·6	6·3	1	49	460	18·9	1 mach.	2	14	9
No. 79	Stockholm ..	Bldg.	104·0	12·5	6·1	1	49			1 1·5-in. Q.F.	2	14	
No. 81	Stockholm ..	Bldg.	104·0	12·5	6·1	1	49			1 1·5-in. Q.F.	2	14	
THIRD CLASS—													
Nos. 141, 143, 145, 147, 149 (5 boats) ..	Stockholm ..	1879 1890	55·0	10·7	4·1	2	21	80	10	..	2	..	1·5
SUBMARINE—													
Unnamed	..	Bldg.	82·0	13·0	..	..	146	100	10·7	..	..	..	..

One first-class and two second-class boats are to be completed in 1903.

Turkey.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes	Complement.	Coal Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
DESTROYERS—													
Berk-Efshan	Gaarden ..	1894	187	21·6	..	2	270	200	25	6 1-pr. revs.	2		
Taljar	Gaarden ..	1894	187	21.6	..	2	270	..	25	6 1-pr. revs.	2		
2 boats	Sestri Ponente	1901	..	..	..	..	..	..	27·5				
FIRST CLASS—													
A. B...	Sestri Ponente	1901	166	18·6	4·0	2	145	2,400	26	2·1 pr.	2	..	16
Edjder (No. 10) ..	Gaarden ..	1890	152·7	18·9	7·4	2	150	2,200	23	5 3-prs. Q.F.	2		
1 boat	Constantinople	1889	140	16	6·9	2	120	1,800	23	5 1-pr. revs.	2		
5 boats	Gaarden ..	1889–90	126·7	15·4	8·6	1	85	1,300	22	2 1-pr. revs.	2	21	9
Timsah	London ..	1887	126	15	..	..	..	..	21·7				
5 boats	Elbing ..	1886	120·3	16·2	..	..	85	900	21	2 Nords.	2	20	10
4 boats	Constantinople	1886–89	100·3	11·8	5·5	1	42	550	19·5	2 mach.			
Tewfik	Normand ..	1885	100·7	13	5·5	1	42	550	20				
2 boats	La Seyne and Constantinople	1885	100·7	13	5·5	1	42	550	20·3	2 Nords.			
2 boats	Teddington	1887	124	15	..	..	..	..	22				
2 boats	Kiel	1892	127	..	..	..	..	..	22				
SUBMARINE—													
Abdul Hamid	Chertsey ..	1886	100	12	..	3	160	250	10	2 mach.	1	..	8
Abdul Medjid.. ..	Chertsey ..	1886	100	12	..	3	160	250	10	2 mach.	1	..	8

United States.

Name.	Where Built.	Launched.	Dimensions. Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament. Guns.	Torpedo Tubes.	Complement.	Maximum Coal Capacity.
DESTROYERS—			ft. in.	ft. in.	ft. in.		Tons.		Knots.				Tons.
Bainbridge ..	Philadelphia	1901	245 0	23 7	6 6	2	420	8,000	29	2 12-pr., 5 6-pr.*	2	64	139
Barry	Philadelphia	1902	245 0	23 7	6 6	2	420	8,000	29	2 12-pr., 5 6-pr.	2	64	139
Chauncey.. ..	Philadelphia	1901	245 0	23 7	6 6	2	420	8,000	29	2 12-pr., 5 6-pr.	2	64	139
Dale	Richmond ..	1900	245 0	23 7	6 6	2	420	8,000	28	2 12-pr., 5 6-pr.	2	64	139
Decatur	Richmond ..	1900	245 0	23 7	6 6	2	420	8,000	28	2 12-pr., 5 6-pr.	2	64	139
Hopkins	Wilmington	1902	244 0	24 6	6 0	2	408	7,200	29	2 12-pr., 5 6-pr.	2	64	150
Hull	Wilmington	1902	244 0	24 6	6 0	2	408	7,200	29	2 12-pr., 5 6-pr.	2	64	150
Lawrence.. ..	Quincy, Mass.	1900	242 3	22 3	6 2	2	400	8,400	30	2 12-pr., 5 6-pr.	2	64	115
Macdonough ..	Quincy, Mass.	1901	242 3	22 3	6 2	2	400	8,400	30	2 12-pr., 5 6-pr.	2	64	115
Paul Jones ..	San Francisco	1900	245 0	23 7	6 6	2	420	7,000	29	2 12-pr., 5 6-pr.	2	64	139
Perry	San Francisco	1900	245 0	23 7	6 6	2	420	7,000	29	2 12-pr., 5 6-pr.	2	64	139
Preble	San Francisco	1901	245 0	23 7	6 6	2	420	7,000	29	2 12-pr., 5 6-pr.	2	64	139
Stewart	Morris Heights	1902	245 0	23 7	6 6	2	420	8,000	29·3	2 12-pr., 5 6-pr.	2	64	139
Truxtun	Baltimore ..	1901	248 0	23 3	6 0	2	433	8,300	30	2 12-pr., 5 6-pr.	2	64	232
Whipple	Baltimore ..	1901	248 0	23 3	6 0	2	433	8,300	30	2 12-pr., 5 6-pr.	2	64	232
Worden	Baltimore ..	1901	248 0	23 3	6 0	2	433	8,300	30	2 12-pr., 5 6-pr.	2	64	232
Bagley	Bath	1900	157 0	17 0	4 7	2	167	..	28	3 3-pr.	3	29	..
Bailey	Morris Heights	1899	205 0	19 0	6 0	2	235	5,000	30	4 6-pr.	2	..	20
Barney	Bath	1900	157 0	17 0	4 7	2	167	..	28	3 3-pr.	3	29	..
Biddle	Bath	1900	157 0	17 0	4 7	2	167	..	28	3 3-pr.	3	29	..
Blakely	Boston ..	1901	175 0	17 6	4 8	2	165	3,000	26	3 3-pr.	3	29	70
De Long	Boston ..	1901	175 0	17 6	4 8	2	165	3,000	26	3 3-pr.	3	29	70
Du Pont	Bristol, R.I.	1897	175 0	17 8	4 8	2	165	3,400	28·58	4 1-pr.	3	32	76
Farragut	San Francisco	1898	213 6	20 8	6 0	2	273	5,000	30	4 6-pr.	2	..	76
Foote..	Baltimore ..	1896	160 0	16 1	5 0	2	142	..	24·5	3 1-pr.	3	24	44
Goldsborough ..	Portland, Ore.	1902	194 8	20 5	5 0	2	247·5	..	30	4 6-pr.	2	..	131
Nicholson ..	Elizabethport	1900	174 6	17 0	4 6	2	174	..	26	3 3-pr.	3	29	..
O'Brien	Elizabethport	1900	174 6	17 0	4 6	2	174	..	26	3 3-pr.	3	29	..
Porter	Bristol, R.I.	1896	175 0	17 8	4 8	2	165	..	28·63	4 1-pr.	3	32	76
Rodgers	Baltimore ..	1896	160 0	16 1	5 0	2	142	2,000	24·5	3 1-pr.	3	24	44
Rowan	Seattle, Wash.	1898	170 0	17 0	5 11	2	182	3,200	26	4 1-pr.	3	32	60
Shubrick	Richmond ..	1899	175 0	17 6	4 8	2	165	3,000	26	3 3-pr.	3	29	70
Stockton	Richmond ..	1899	175 0	17 6	4 8	2	165	3,000	26	3 3-pr.	3	29	70
Stringham ..	Wilmington	1899	225 0	22 0	6 6	2	340	7,200	30	7 6-pr.	2	..	120
Thornton	Richmond	1900	175 0	17 6	4 8	2	165	3,000	26	3 3-pr.	3	29	70
Tingey	Baltimore ..	1901	175 0	17 6	4 8	2	165	3,000	26	3 3-pr.	3	29	70
Wilkes	Morris Heights	Bldg.	175 0	17 6	4 8	2	165	3,000	26·25	3 3-pr.	3	29	70
Winslow	Baltimore ..	1897	160 0	16 1	5 0	2	142	2,000	24·5	3 1-pr.	3	24	44
SEA-GOING—													
Cushing	Bristol, R.I.	1890	138 9	14 3	4 11	2	105	1,720	22·5	3 1-pr.	3	23	36
Davis	Portland, Ore.	1898	146 0	15 4	5 4	2	132	1,750	22·5	3 1-pr.	3	..	..
Dahlgren	Bath	1899	147 0	16 4	4 7	2	146	4,200	30·5	4 1-pr.	2	..	32
Ericsson	Dubuque, Iowa	1894	149 7	15 6	4 9	2	120	1,800	24	4 1-pr.	3	23	35
Fox	Portland, Ore.	1898	146 0	15 4	5 4	2	132	1,750	22·5	3 1-pr.	3	..	..
Manly	Yarrow ..	..	..	..	..	..	..	..	..	..	..	..	..
Morris	Bristol, R.I.	1898	138 3	15 6	4 1	2	105	1,750	24	3 1-pr.	3	..	28
Somers	Schichau, Elbing ..	..	149 3½	17 5	..	2	145	..	..	..	..	..	..
T. A. M. Craven	Bath	1899	147 0	16 4	4 7	2	146	4,200	30·5	4 1-pr.	2	..	32
THIRD CLASS—													
Gwin..	Bristol, R.I.	1897	99 6	12 6	3 3	1	46	850	20·88	1 1-pr.	2	..	8
Mackenzie ..	Philadelphia	1898	99 3	12 9	4 3	1	65	850	20	1 1-pr.	2	..	15·3
McKee	Philadelphia	1898	99 3	12 9	4 3	1	65	850	19·82	2 1-pr.	2	..	..
Talbot	Bristol, R.I.	1897	99 6	12 6	3 3	1	46	850	21·15	1 1-pr.	2	..	8·8
Stiletto (wood)	Bristol, R.I.	..	88 6	11 0	3 0	1	31	359	18·22	..	2	..	4
SUBMARINE—													
Adder	Elizabethport	1901	63 4	11 9	..	1	120	160	7—8	..	1	..	..
Grampus ..	S. Francisco	Bldg.	63 4	11 9	..	1	120	160	7—8	..	1	..	..
Holland	Elizabethport	1896	54 0	10 3	..	1	74	45	8	1 dynamite	1	5	..
Moccassin ..	Elizabethport	1901	63 4	11 9	..	1	120	160	7—8	..	1	..	..
Pike	S. Francisco	Bldg.	63 4	11 9	..	1	120	160	7—8	..	1	..	..
Plunger	Baltimore ..	1898	85 3	11 6	..	1	168	70	7—8	..	2	..	..
Porpoise	Elizabethport	1901	63 4	11 9	..	1	120	160	7—8	..	1	..	..
Shark	Elizabethport	1901	63 4	11 9	..	1	120	160	7—8	..	1	..	..

* Guns of destroyers of this class are Driggs Semi-Automatic Quick-Firers.

With the exception of the Lawrence, Macdonough, and Stewart, all the destroyers in the first alphabetical list have Thornycroft water-tube boilers. The Farragut, Goldsborough and Stringham have also boilers of this type.

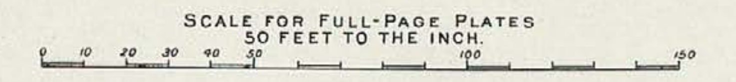
The submarine Fulton, of the Holland type, built experimentally by the Holland Company, was launched June, 1901.

The Protector, a boat of the Lake type, is under trial. An appropriation of £102,670 has been made (1903) for the purchase of other submarine boats.

PLANS

OF

BRITISH AND FOREIGN SHIPS



SCALE FOR HALF-PAGE PLATES.
100 FEET TO THE INCH.
0 10 20 30 40 50 60 70 80 90 100 200 300

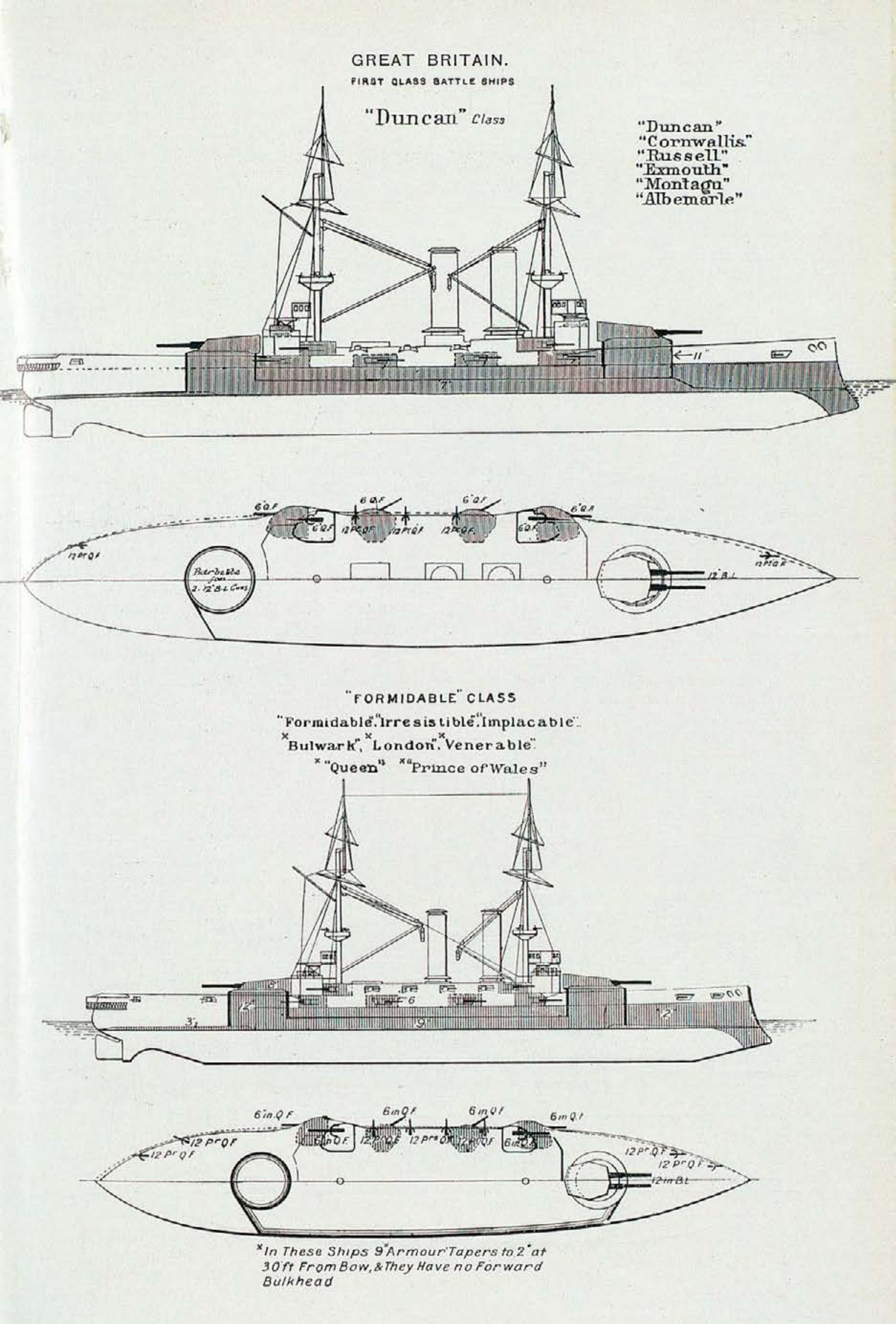

GREAT BRITAIN.
FIRST CLASS BATTLE SHIPS
"Duncan" Class
"Duncan"
"Cornwallis."
"Russell"
"Exmouth"
"Montagu"
"Albemarle"
"FORMIDABLE" CLASS
"Formidable"."Irresistible"."Implacable".
×"Bulwark", ×"London". ×"Venerable".
×"Queen" ×"Prince of Wales"
*In These Ships 9" Armour Tapers to 2" at 30 ft From Bow, & They Have no Forward Bulkhead

PLATE 1.

b

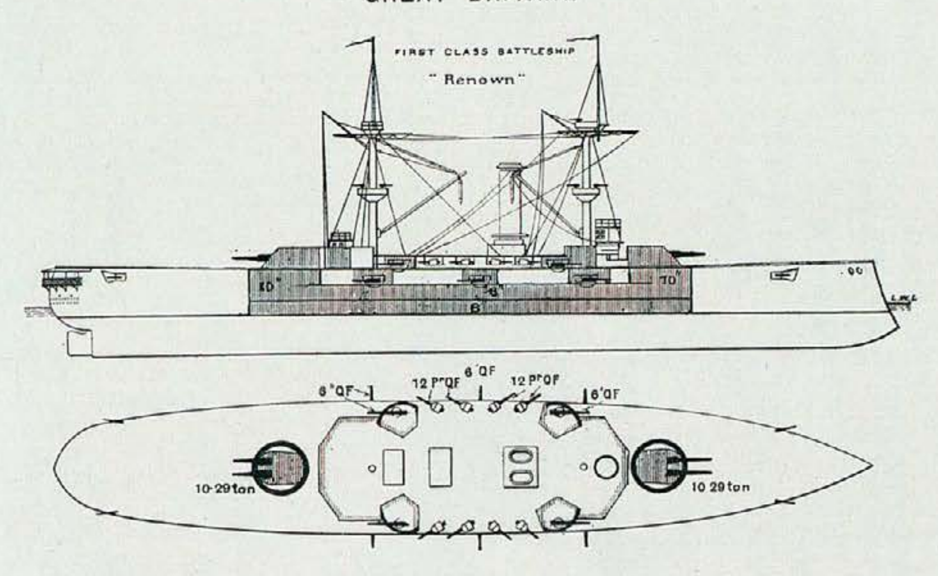
GREAT BRITAIN.

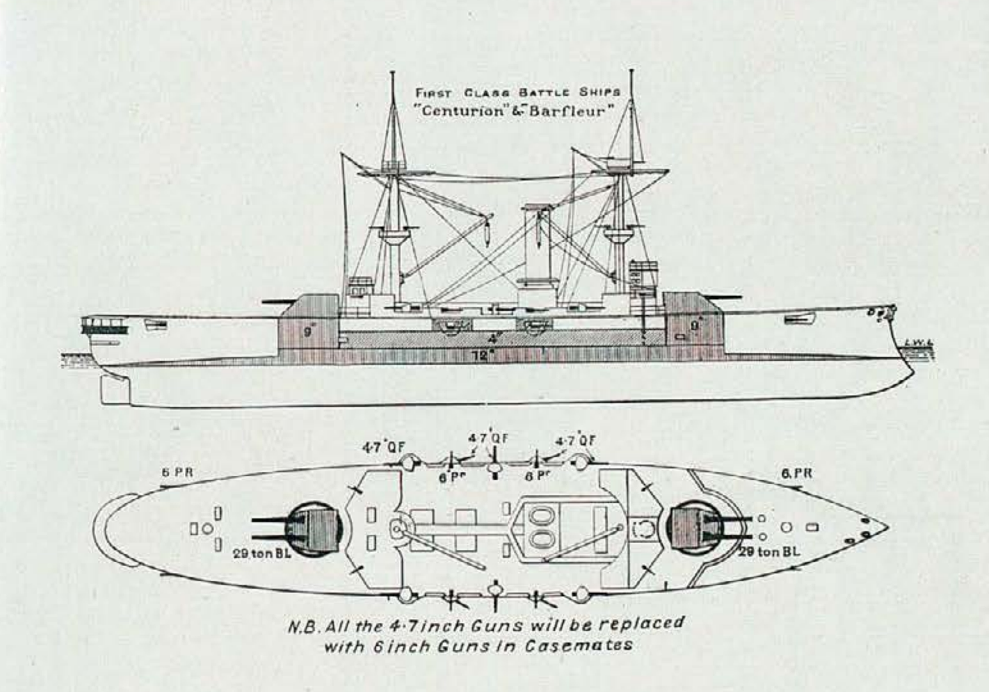
KING EDWARD VII CLASS

"King Edward VII"
"Dominion"
"Commonwealth"

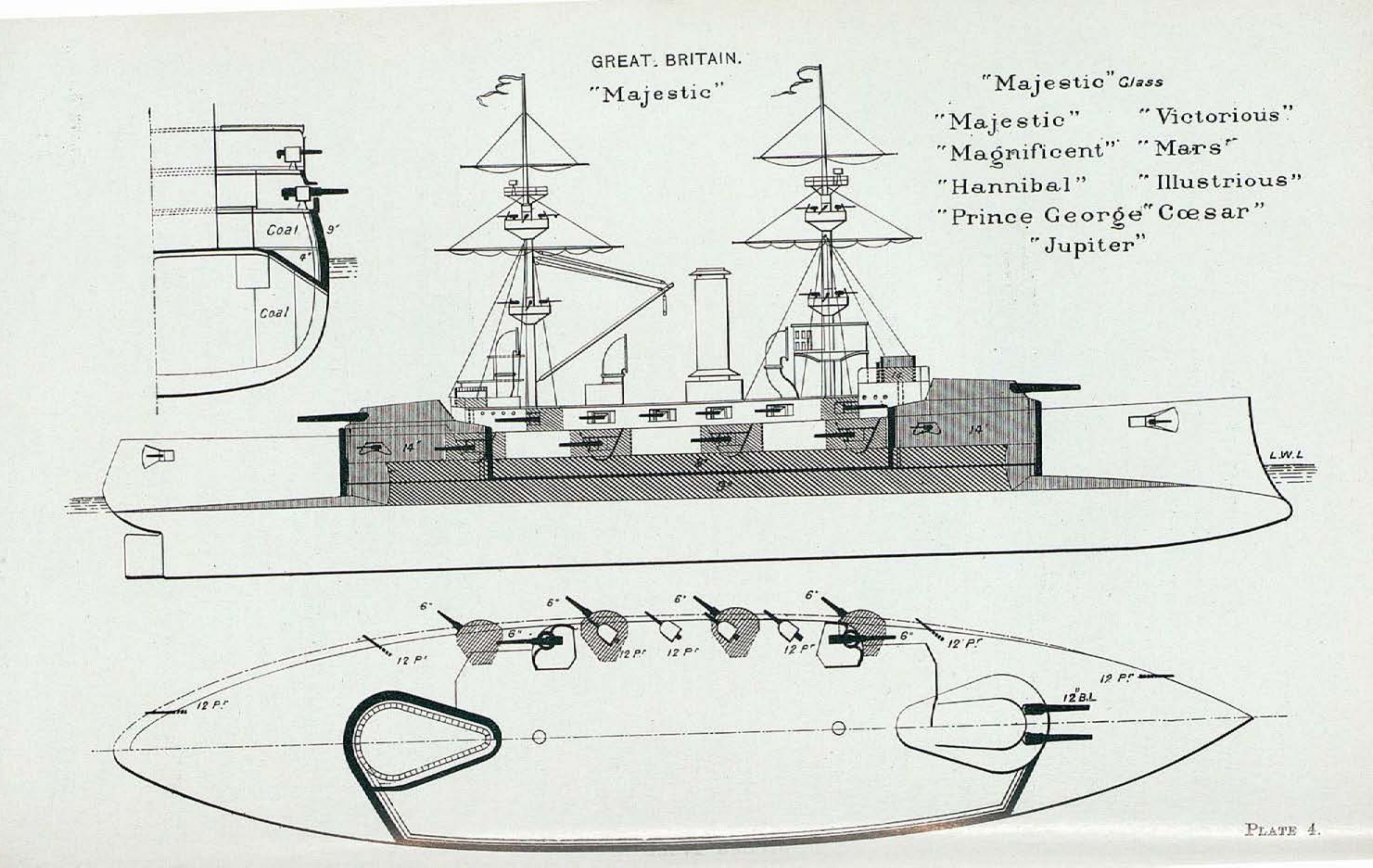
SHIPS OF
"Canopus" Class

"Albion" "Glory"
"Canopus" "Goliath"
"Ocean" "Vengeance"





N.B. All the 4·7 inch Guns will be replaced with 6 inch Guns in Casemates


GREAT. BRITAIN.
"Majestic"
"Majestic" Class
"Majestic" "Victorious"
"Magnificent" "Mars"
"Hannibal" "Illustrious"
"Prince George" "Cœsar"
"Jupiter"
Coal
Coal
9"
4"
14"
14"
8"
9"
L.W.L
6"
6"
6"
6"
6"
6"
12 P.r
12 P.r
12 P.r
12 P.r
12 P.r
12 P.r
12 P.r
12" B.L
PLATE 4.

"Royal Sovereign" Class

14.150 tons 13.000, I.H.P

×"Hood"
"Empress of India"
"Ramillies"
"Repulse"
"Resolution"
"Revenge"
"Royal Oak"
"Royal Sovereign"

On Special Scale

17"
5"
18"
17"
L.W.L.

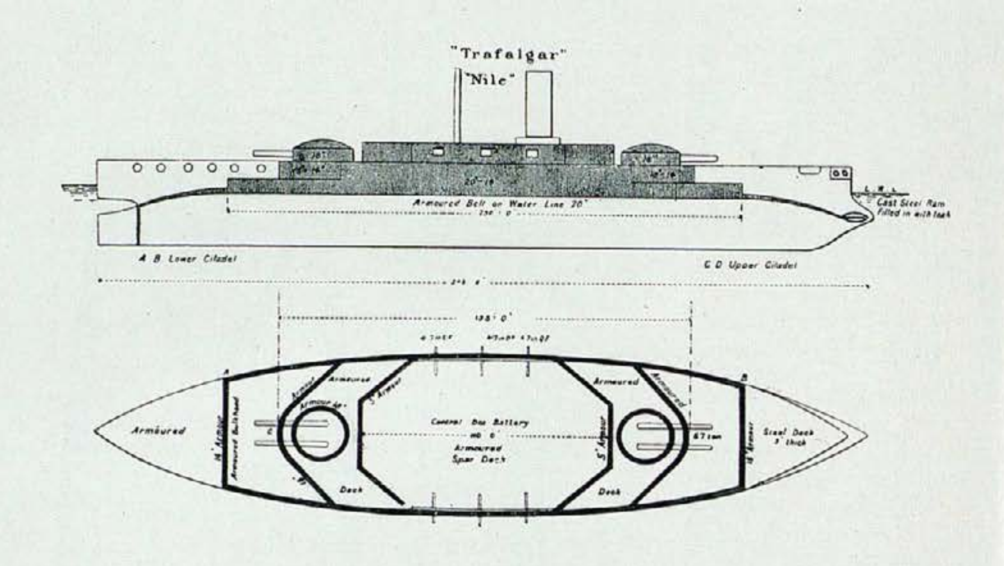
×The 67 Ton Guns are in Turrets.

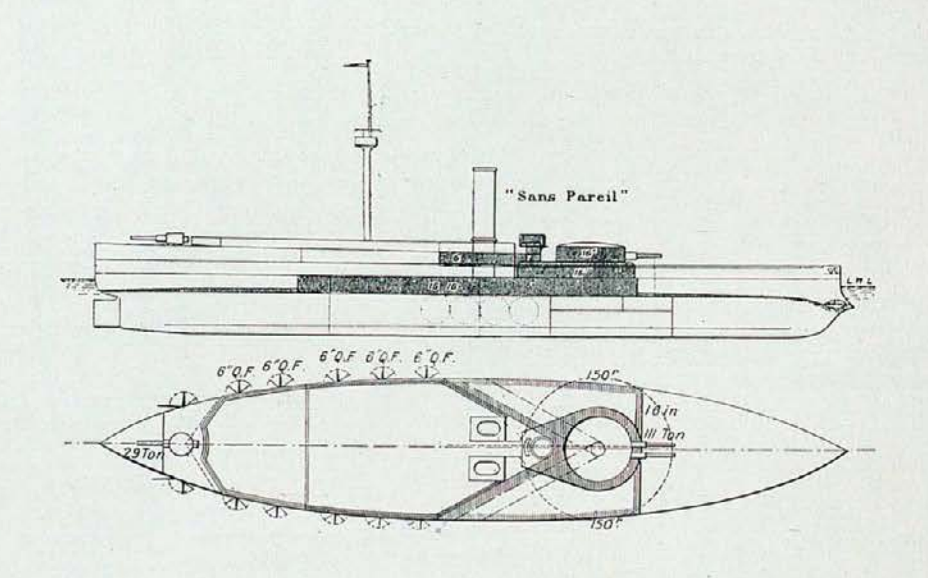
6" Q.F.
6" Q.F.
6in Q.F.
6" Q.F.
6" Q.F.
67 ton
67 ton

N.B. The 6 in Guns on Upper Deck
Will all be put into Casemates.

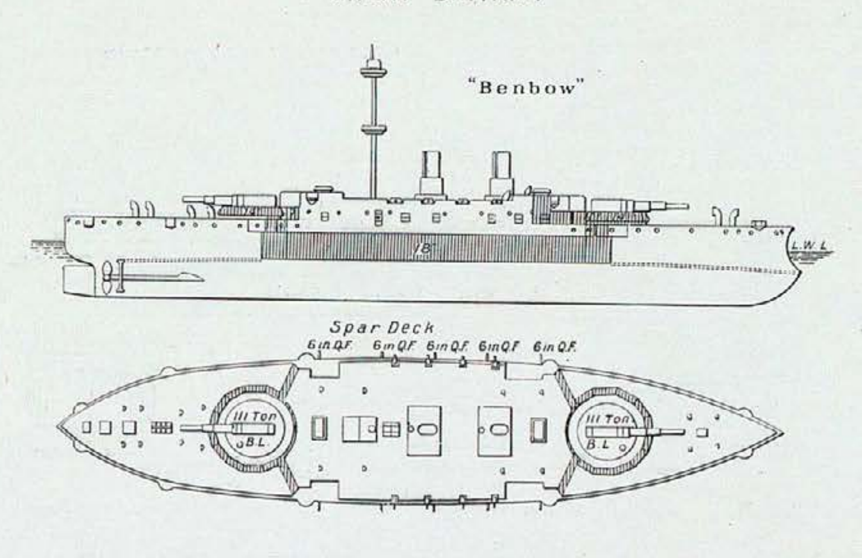
PLATE 5.

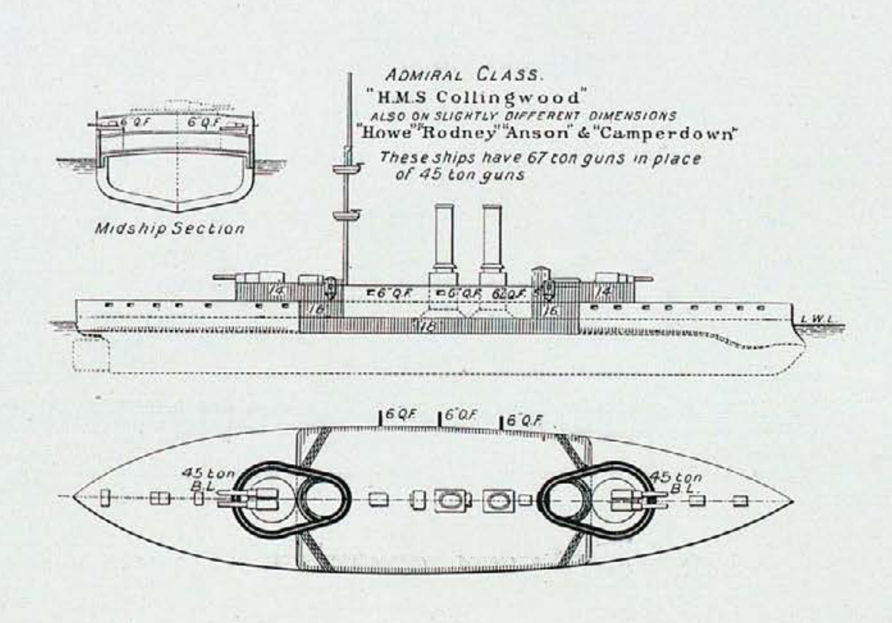
GREAT BRITAIN.



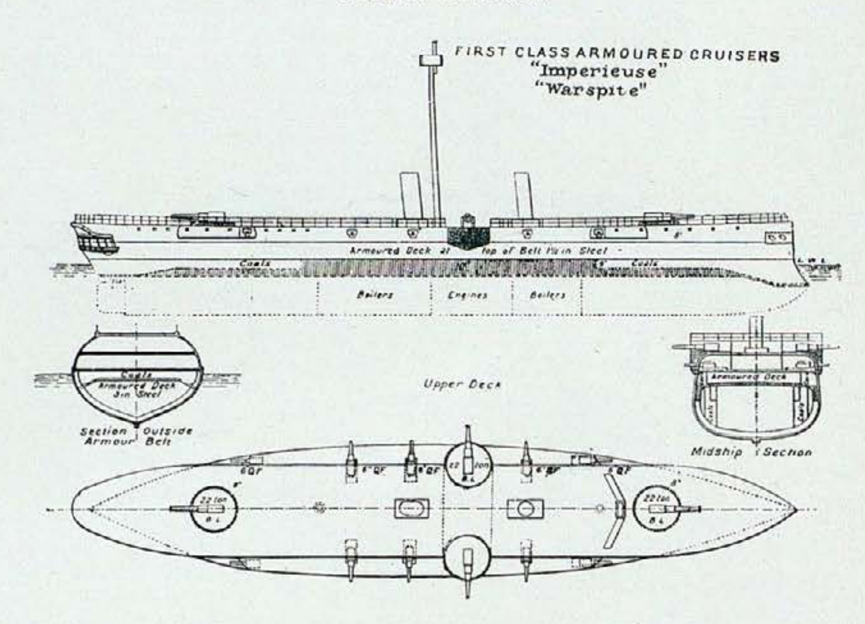


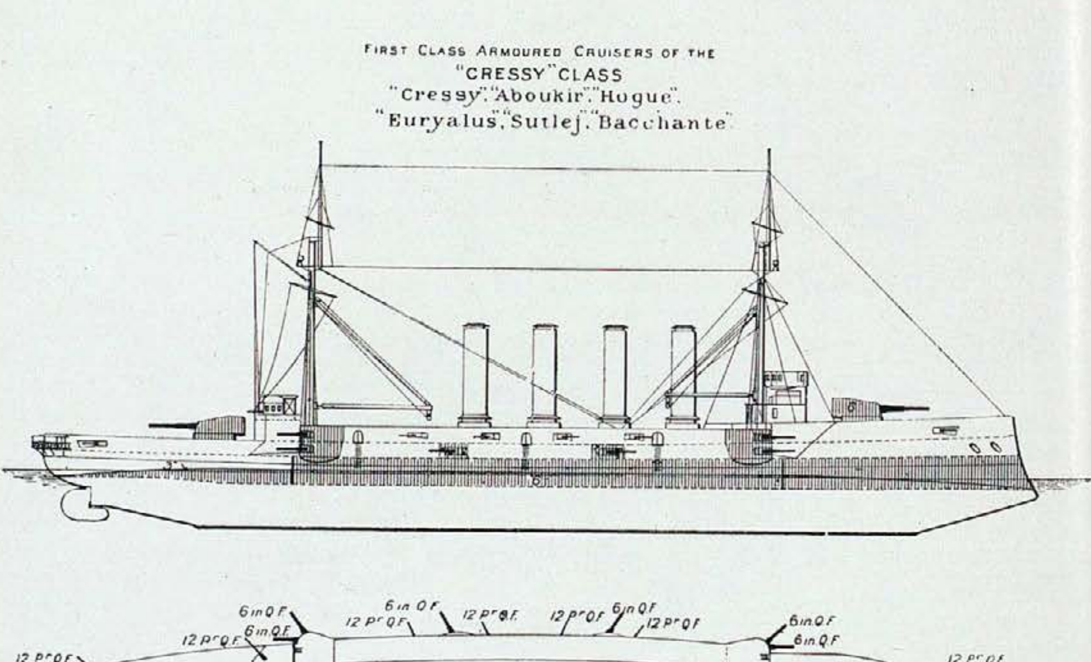
GREAT BRITAIN.





GREAT BRITAIN.





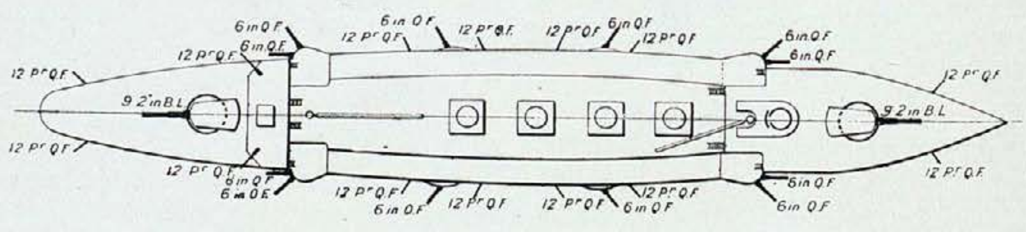


PLATE 8.

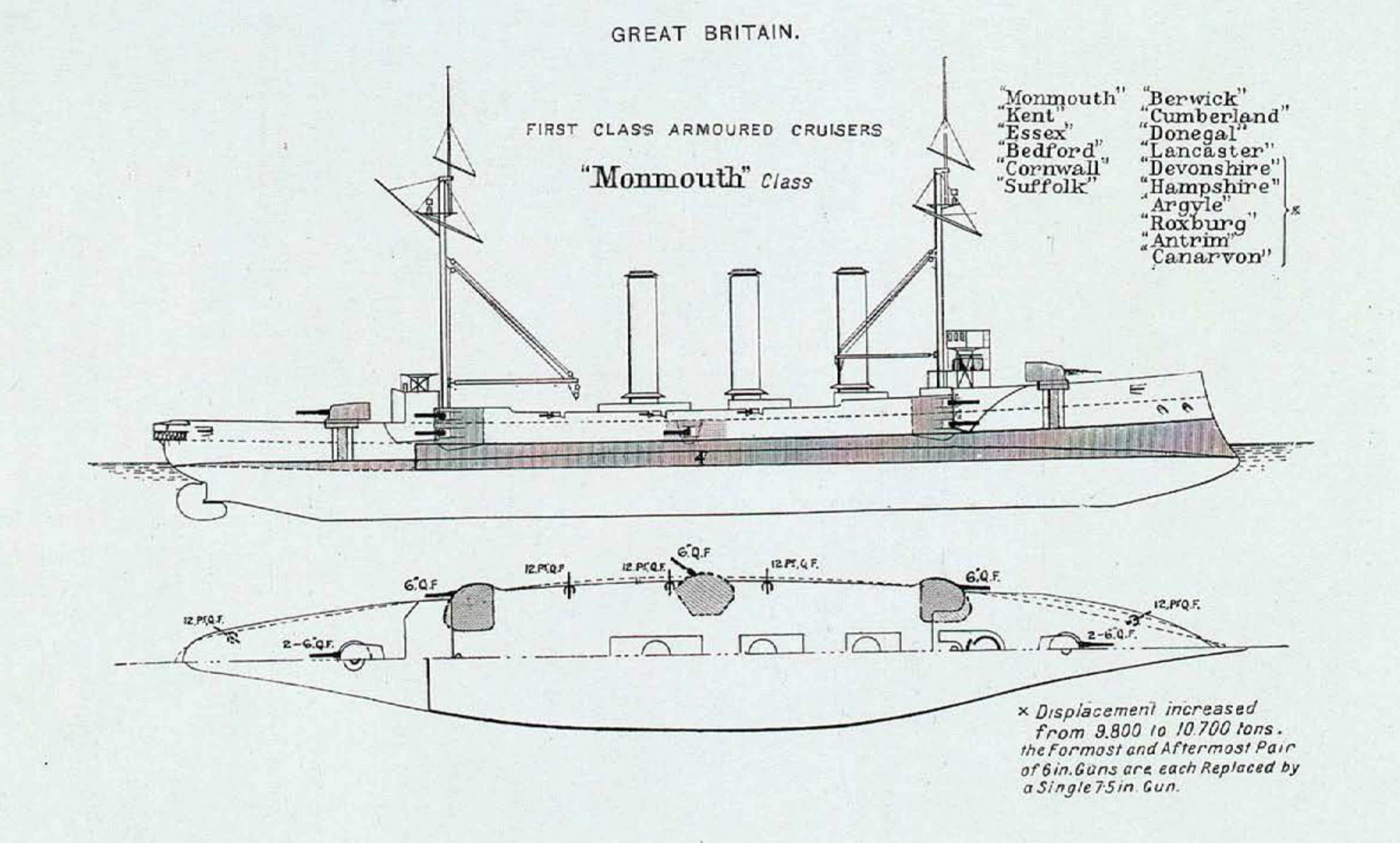

GREAT BRITAIN.
FIRST CLASS ARMOURED CRUISERS
"Monmouth" Class
"Monmouth" "Kent" "Essex" "Bedford" "Cornwall" "Suffolk"
"Berwick" "Cumberland" "Donegal" "Lancaster"
"Devonshire" "Hampshire" "Argyle" "Roxburg" "Antrim" "Canarvon" ×
6" Q.F
12 Pr Q.F.
6" Q.F
12 Pr Q.F.
12 Pr, Q.F.
6" Q.F.
2–6" Q.F.
× Displacement increased from 9.800 to 10.700 tons. the Formost and Aftermost Pair of 6 in. Guns are each Replaced by a Single 7·5 in. Gun.

PLATE 9.

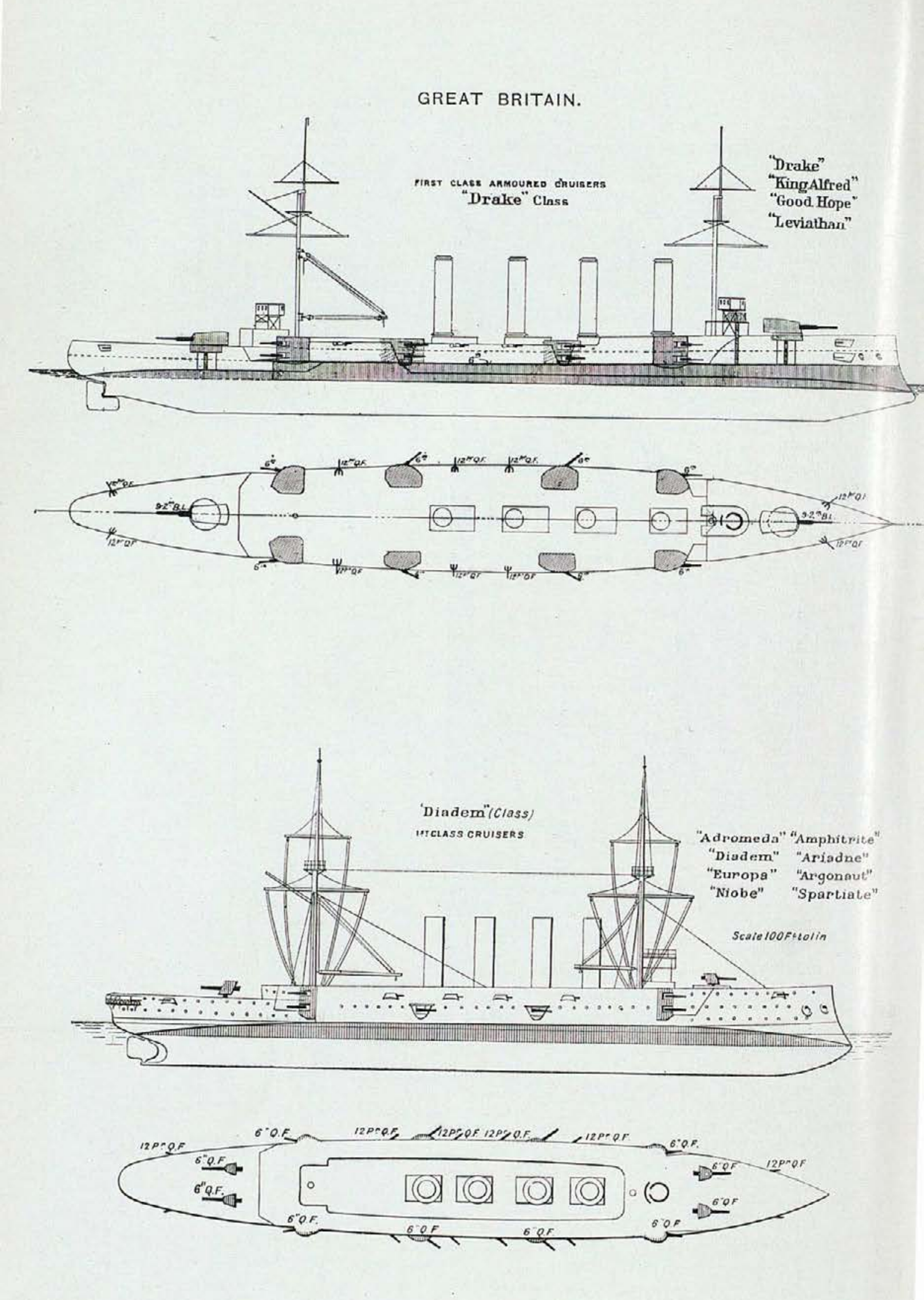
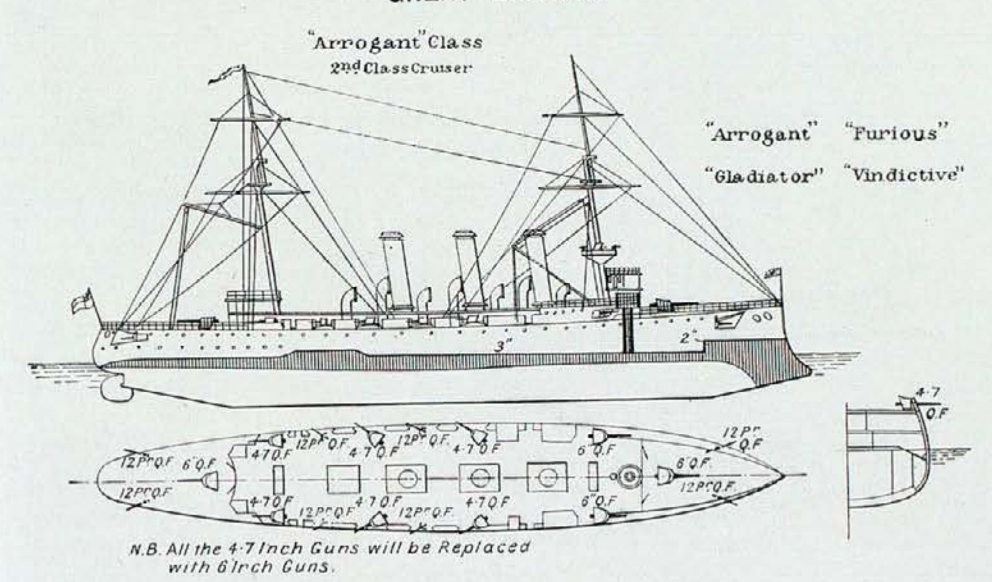

GREAT BRITAIN.
FIRST CLASS ARMOURED CRUISERS
"Drake" Class
"Drake"
"King Alfred"
"Good Hope"
"Leviathan"
'Diadem"(Class)
1ST CLASS CRUISERS
"Adromeda" "Amphitrite"
"Diadem" "Ariadne"
"Europa" "Argonaut"
"Niobe" "Spartiate"
Scale 100 Ft to 1 in

PLATE 10.

GREAT BRITAIN.



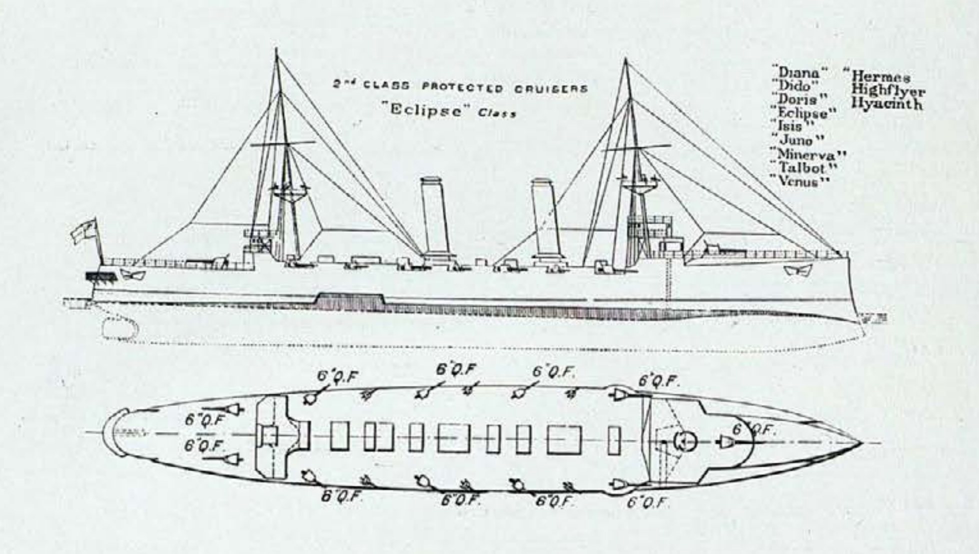
N.B. All the 4·7 Inch Guns will be Replaced with 6 Inch Guns.

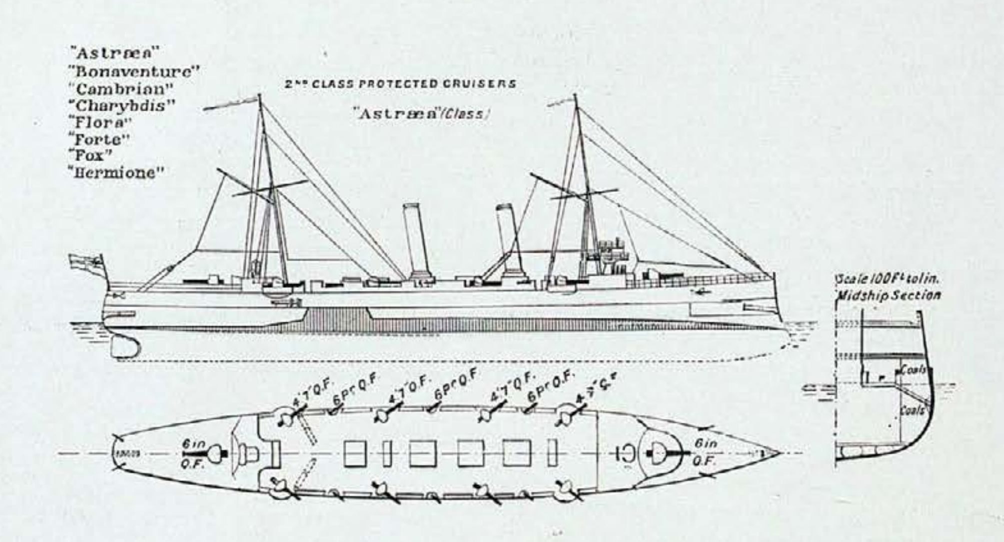
"Powerful"
"Terrible"
First Class Cruisers

L.W.L.

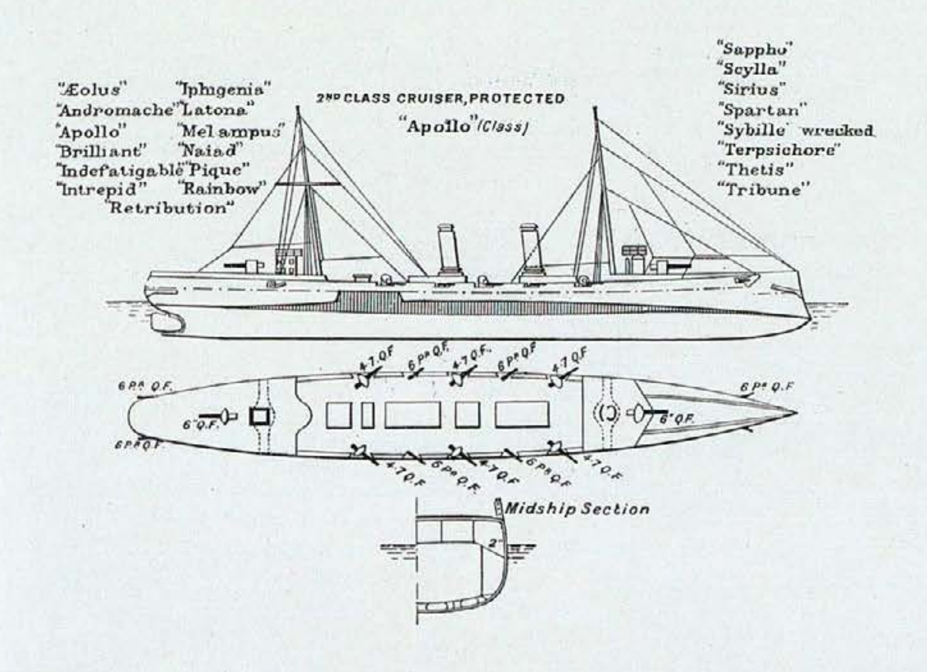
12 Pr Q.F.
9.2 B.L.
6" Q.F.
12 Pr Q.F.
6" Q.F.

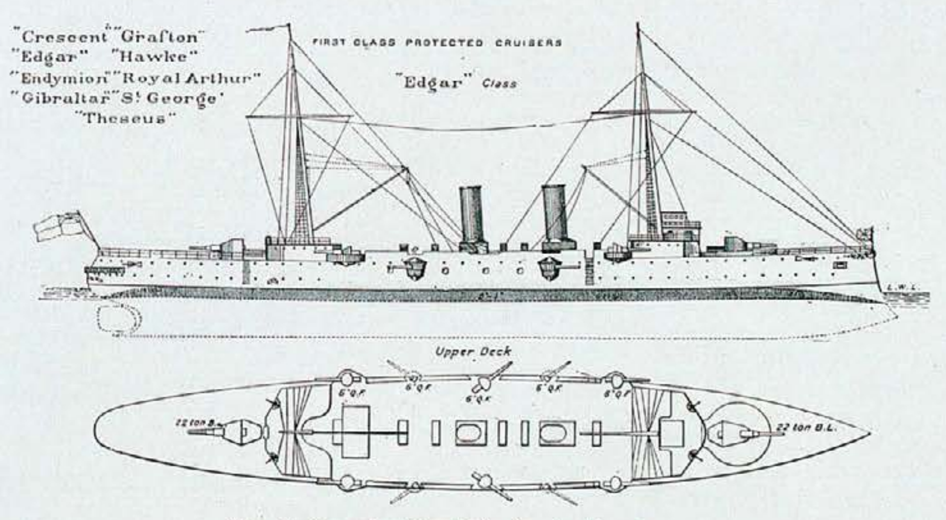
N.B. Four 6 in. Guns in Casemates will be added.


2nd CLASS PROTECTED CRUISERS
"Eclipse" Class
"Diana"
"Dido"
"Doris"
"Eclipse"
"Isis"
"Juno"
"Minerva"
"Talbot"
"Venus"
"Hermes
Highflyer
Hyacinth
6" Q.F.


"Astraea"
"Bonaventure"
"Cambrian"
"Charybdis"
"Flora"
"Forte"
"Fox"
"Hermione"
2nd CLASS PROTECTED CRUISERS
"Astraea" (Class)
Scale 100 Ft to 1 in.
Midship Section
Coals
4.7" Q.F.
6 Pr Q.F.
6 in Q.F.

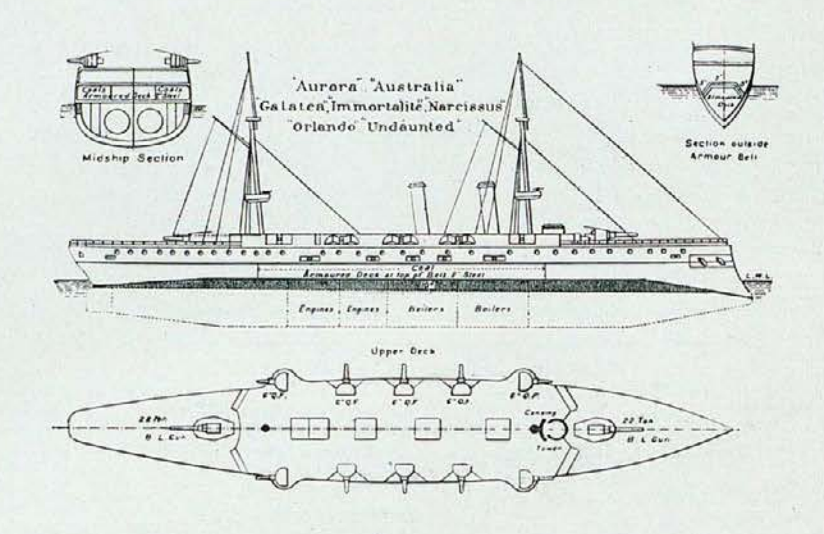
GREAT BRITAIN.

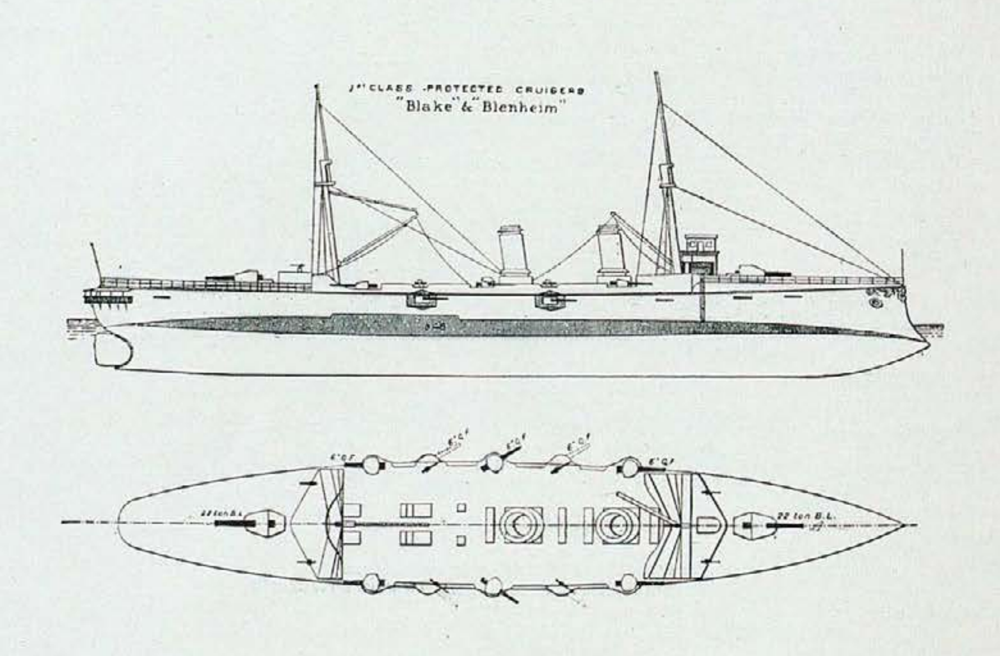




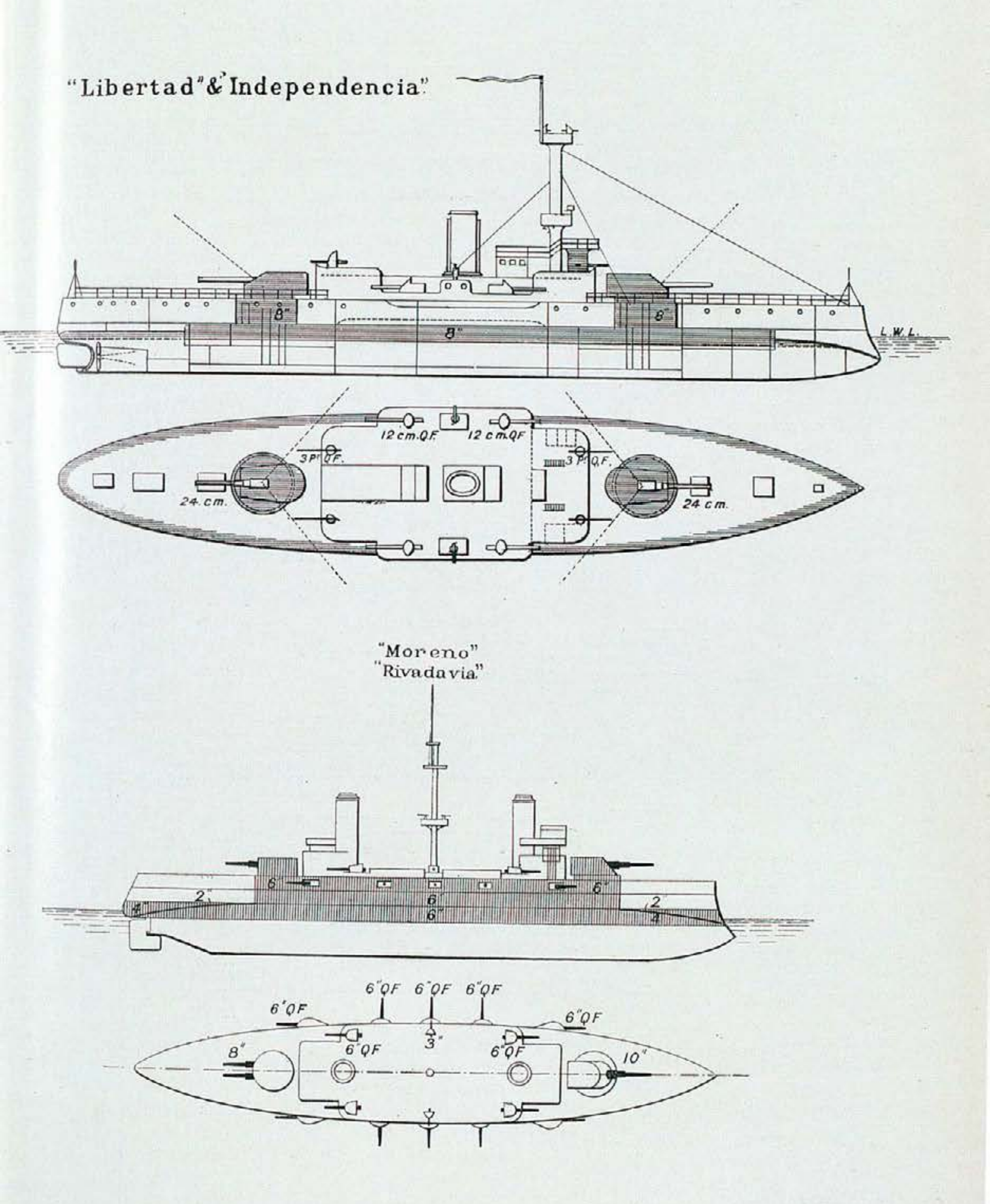
Note. *The Crescent and Royal Arthur have two 6 in guns forward in place of the 22 ton gun*, and have a forecastle.

GREAT BRITAIN.

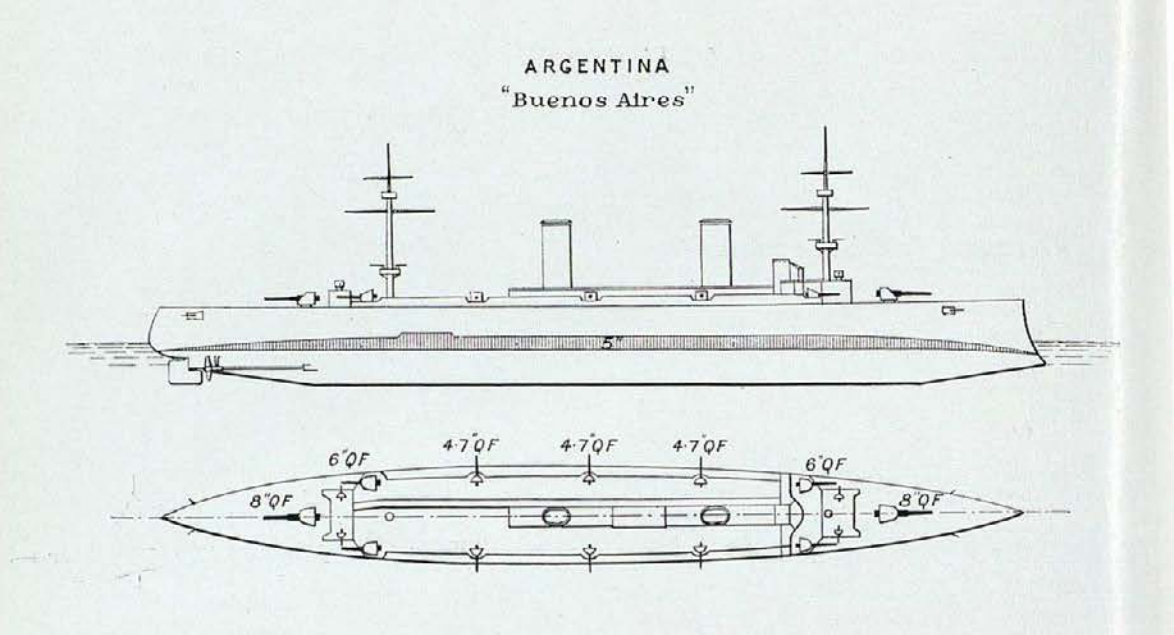


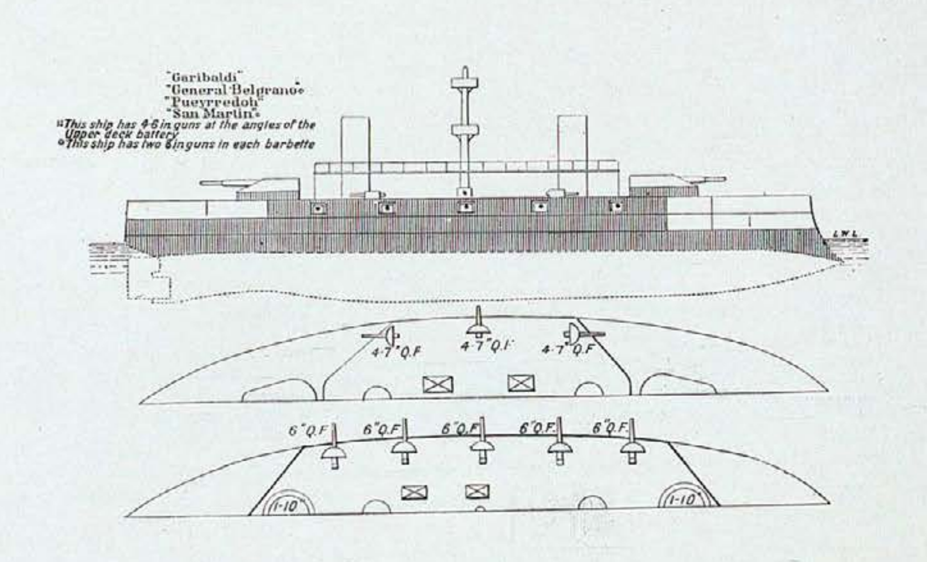


ARGENTINA.

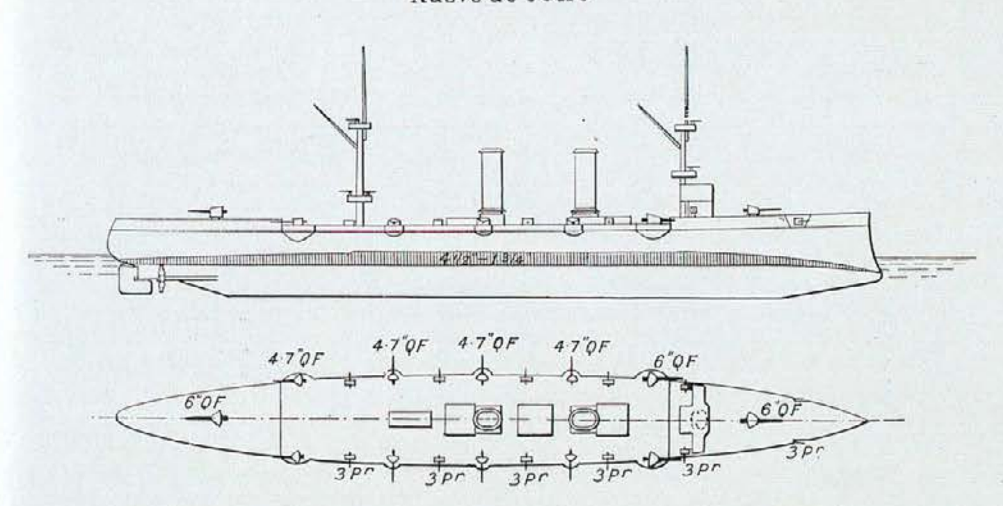


"Libertad" & "Independencia"
8"
8"
8"
L.W.L.
12 cm.Q.F.
12 cm.Q.F.
3Pr Q.F.
3Pr Q.F.
24 cm.
24 cm.
"Moreno"
"Rivadavia"
6"
6"
6"
6"
2"
2"
4"
4"
6"QF
6"QF
6"QF
6"QF
6"QF
6"QF
6"QF
8"
3"
10"


ARGENTINA
"Buenos Aires"
5"
6" QF
4·7" QF
4·7" QF
4·7" QF
6" QF
8" QF
8" QF

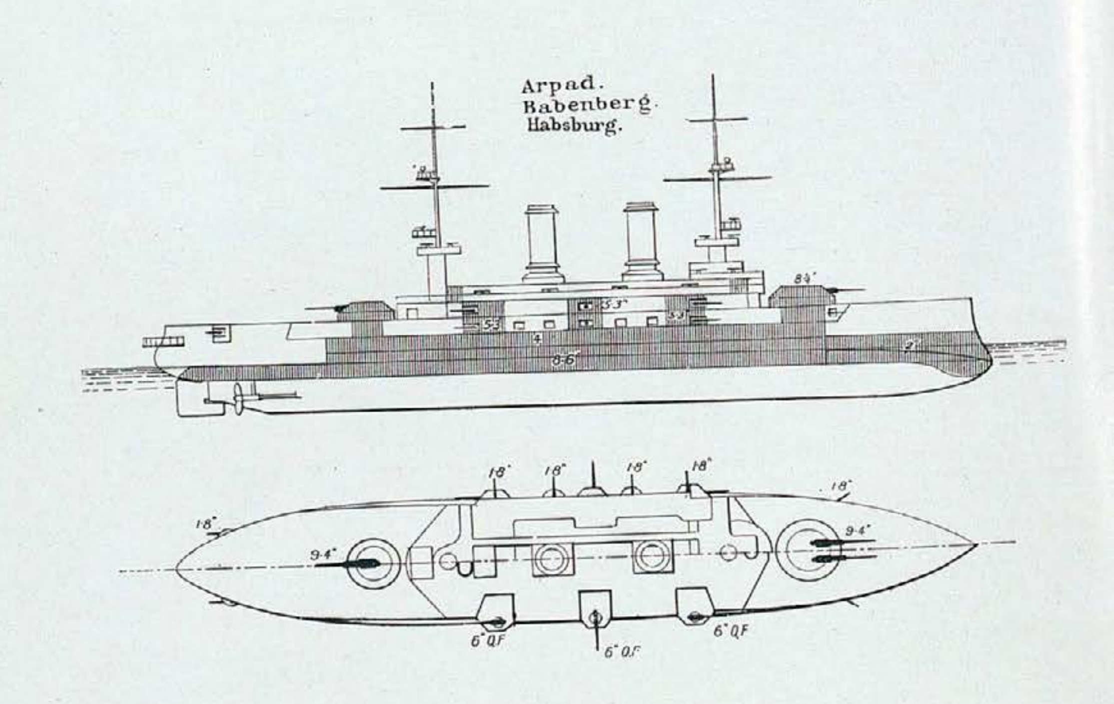

"Garibaldi"
"General Belgrano"°
"Pueyrredon"¤
"San Martin"°
¤This ship has 4·6 in guns at the angles of the Upper deck battery
°This ship has two 8 in guns in each barbette
L.W.L.
4·7" Q.F
4·7" Q.F
4·7" Q.F
6" Q.F
6" Q.F
6" Q.F
6" Q.F
6" Q.F
(1-10")
(1-10")

ARGENTINA
"Nueve de Julio"

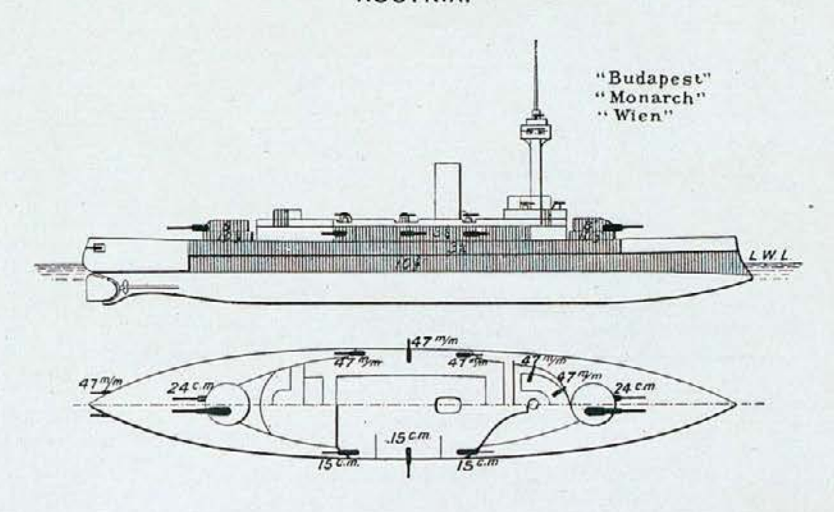


AUSTRIA.

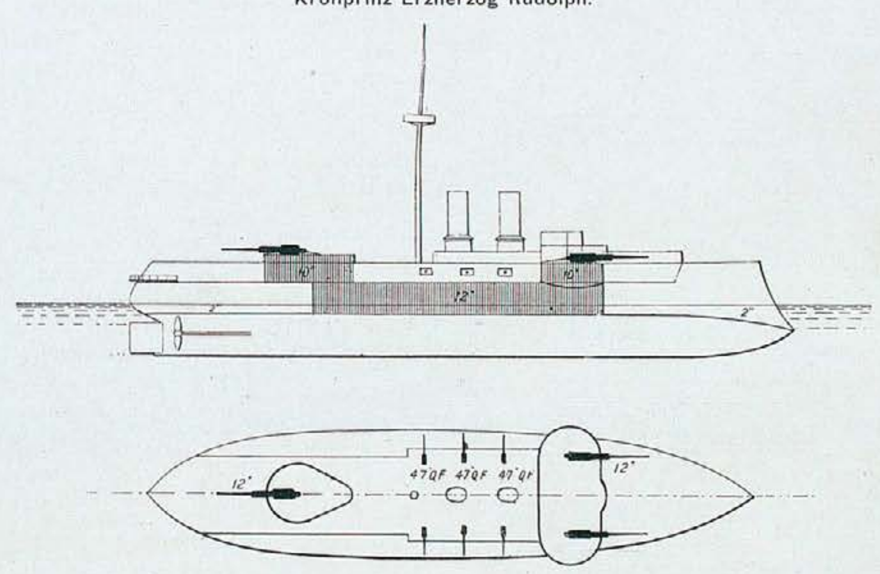
"A"(Ersatz Laudon)
"B"(Ersatz Drache)



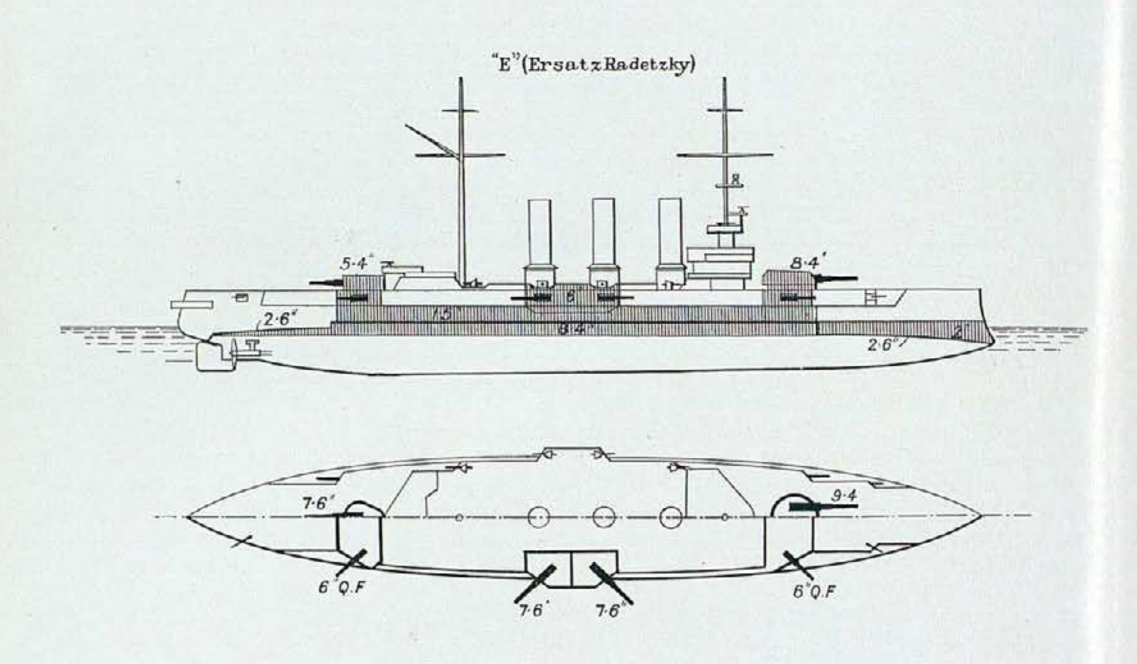
AUSTRIA.

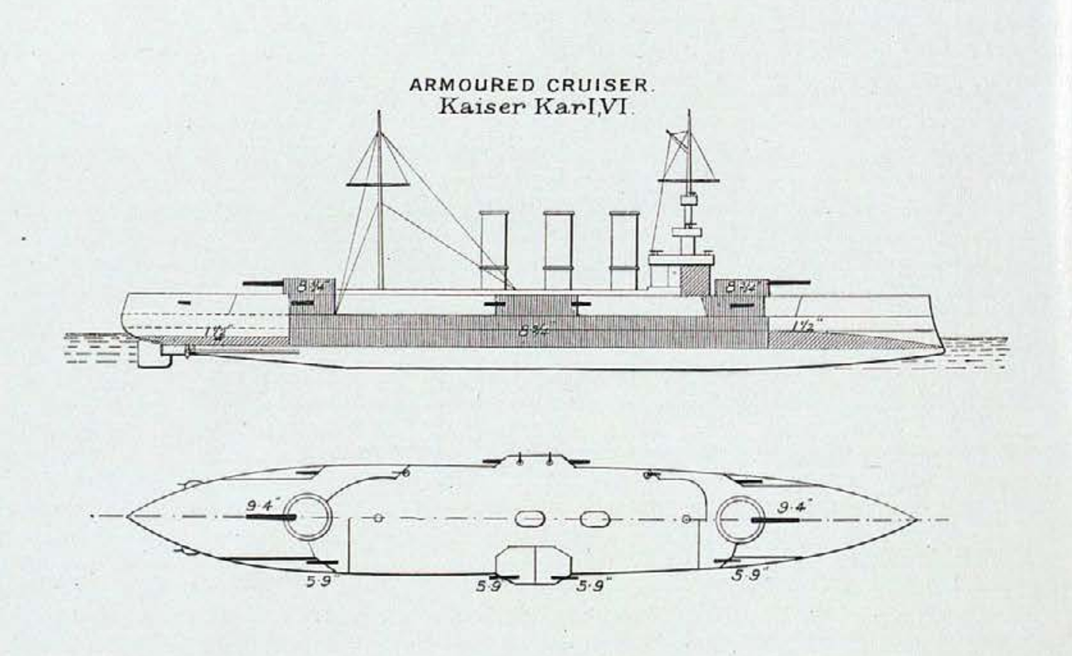


Kronprinz Erzherzog Rudolph.

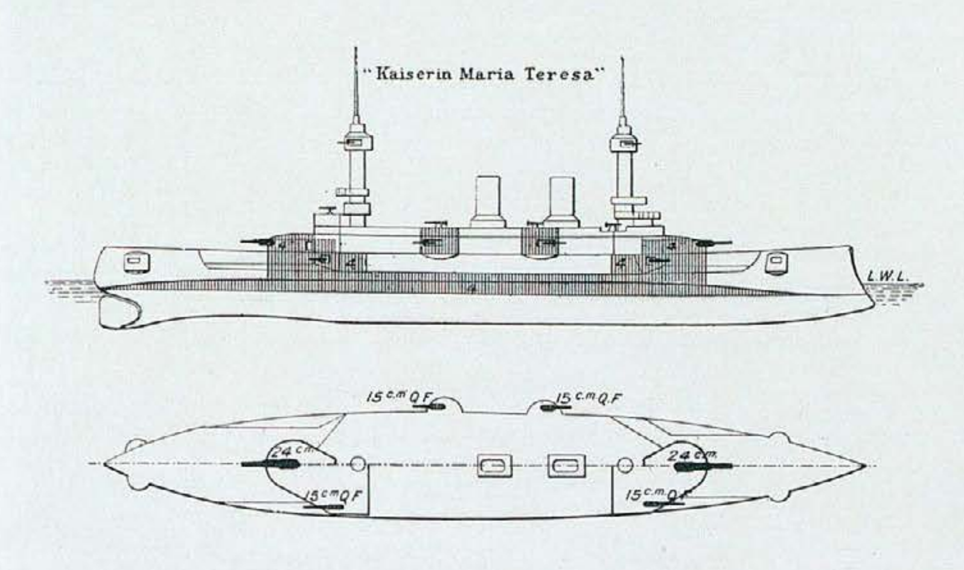


AUSTRIA.

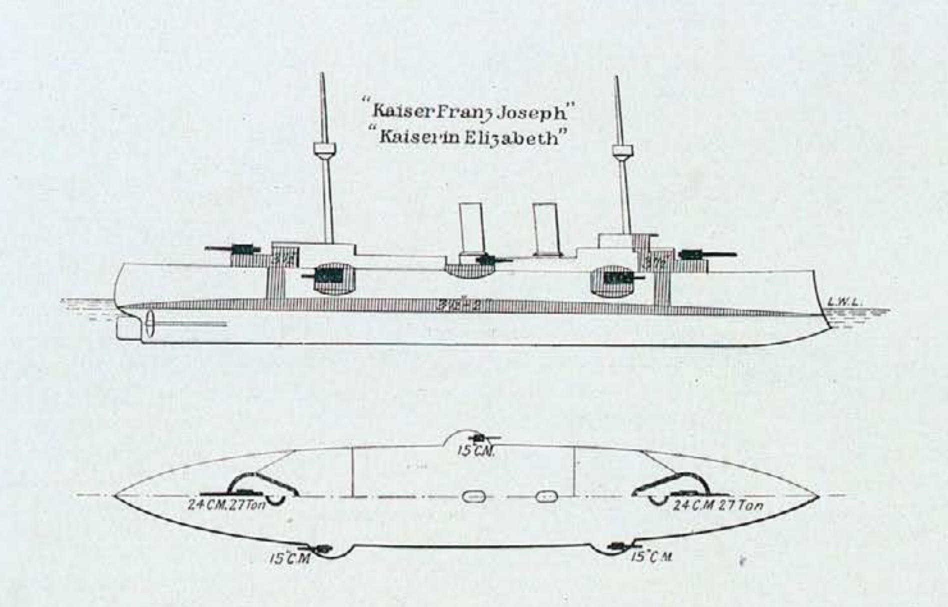

"E" (Ersatz Radetzky)
5·4"
8·4"
2·6"
1·5"
8·4"
6
2·6"
2"
7·6"
9·4
6" Q.F
7·6"
7·6"
6" Q.F


ARMOURED CRUISER.
Kaiser Karl VI.
8 1/4"
8 1/4"
1 1/2"
8 1/4"
1 1/2"
9·4"
9·4"
5·9"
5·9"
5·9"
5·9"

AUSTRIA.

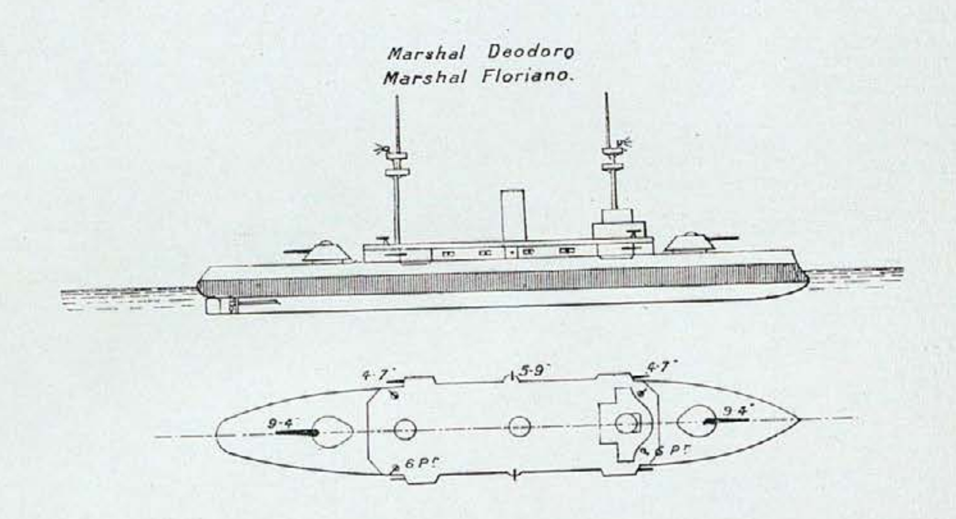


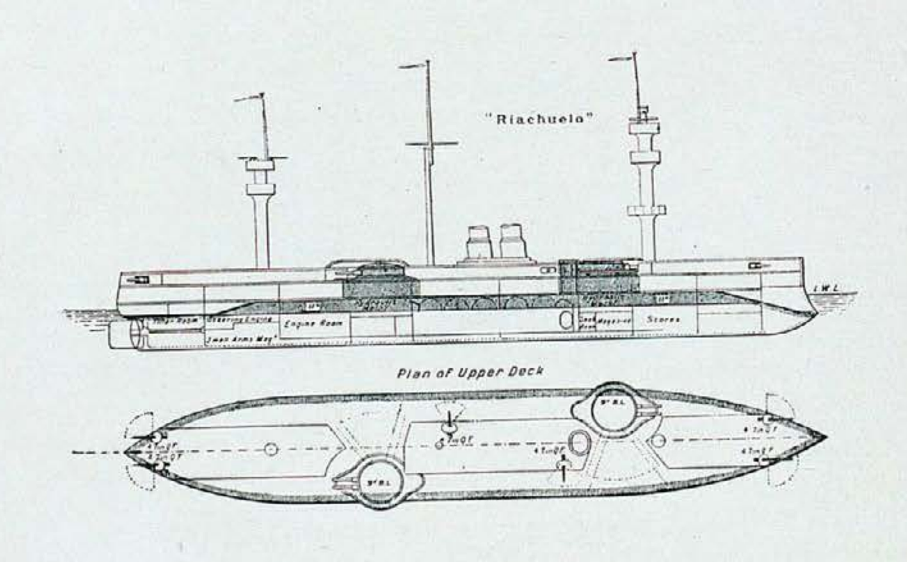
"Kaiserin Maria Teresa"
L.W.L.
15 c.m Q.F.
15 c.m Q.F
24 cm
24 cm
15 c.m Q.F
15 c.m Q.F



"Kaiser Franz Joseph"
"Kaiserin Elizabeth"
L.W.L.
15 C.M.
24 C.M. 27 Ton
24 C.M 27 Ton
15 C.M
15 C.M.

BRAZIL.

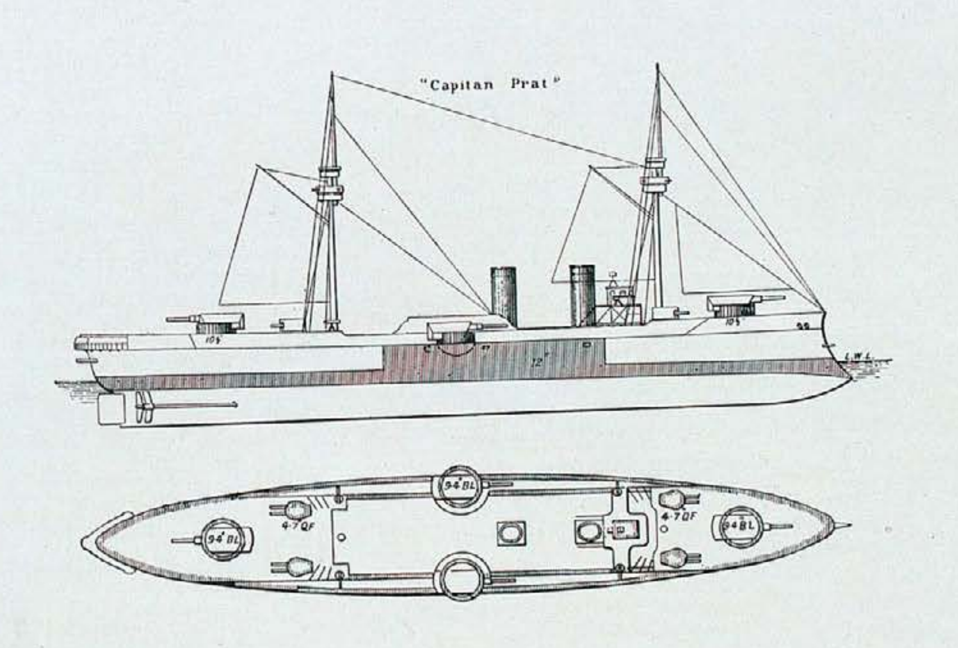

Marshal Deodoro
Marshal Floriano.
4·7"
5·9"
4·7"
9·4"
9·4"
6 Pr
6 Pr


"Riachuelo"
L.W.L
Engine Room
Stores
Plan of Upper Deck

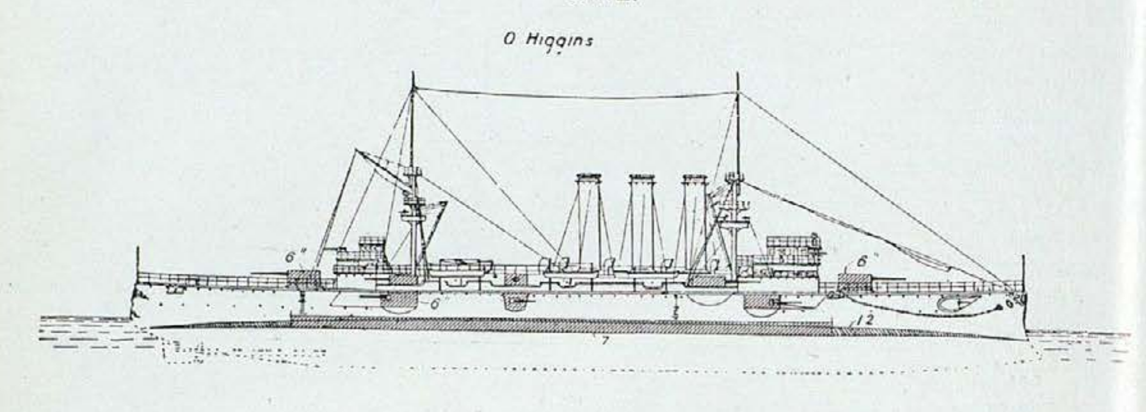
CHILI.

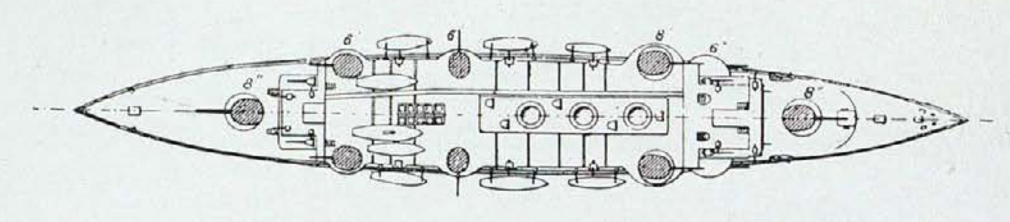
"Libertad"
"Constitucion"

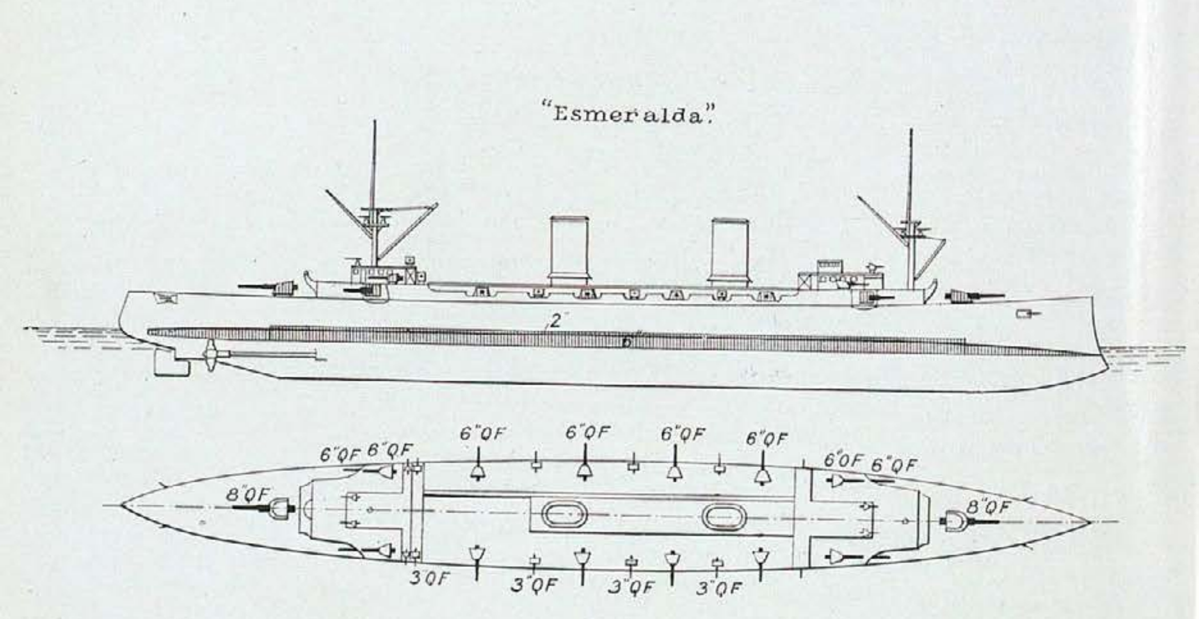
7·5" QF
14 PR
14 PR
7·5" QF
3"
3"
10"
10"
10
10
3"
3"
6"
6
14 PR
14 PR
7·5" QF
7·5" QF
7·5" QF
7·5" QF
7·5" Q.F.
7·5" QF



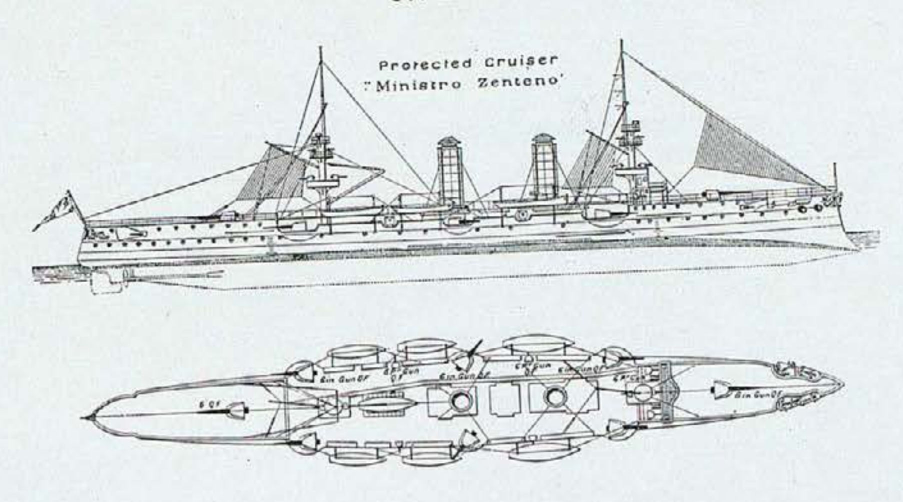
CHILI.

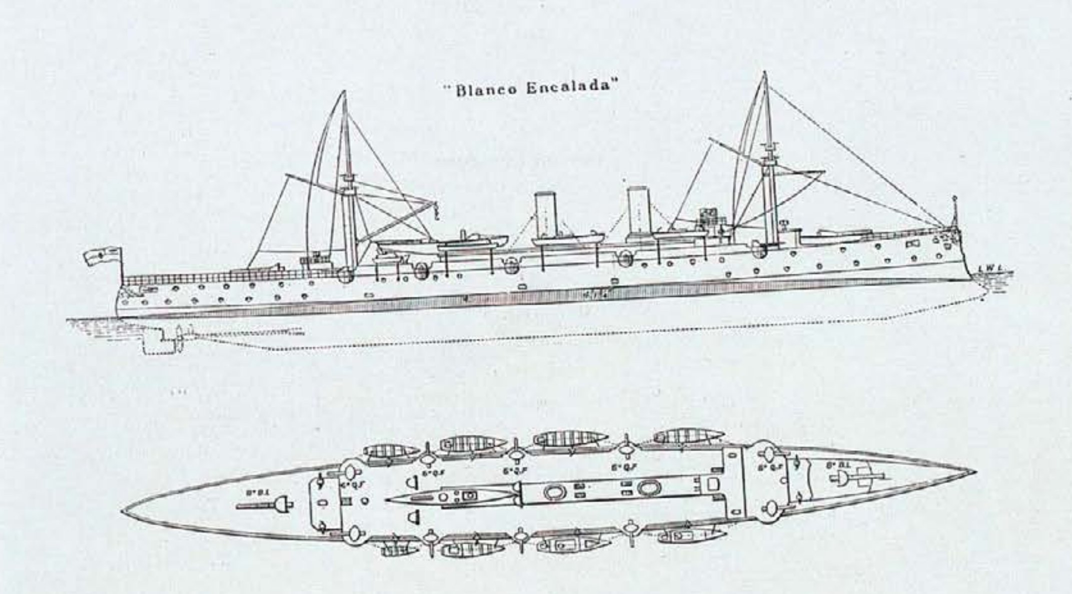

O Higgins
6"
6"
6"
12
7


6
6
8
6"
8"
8"

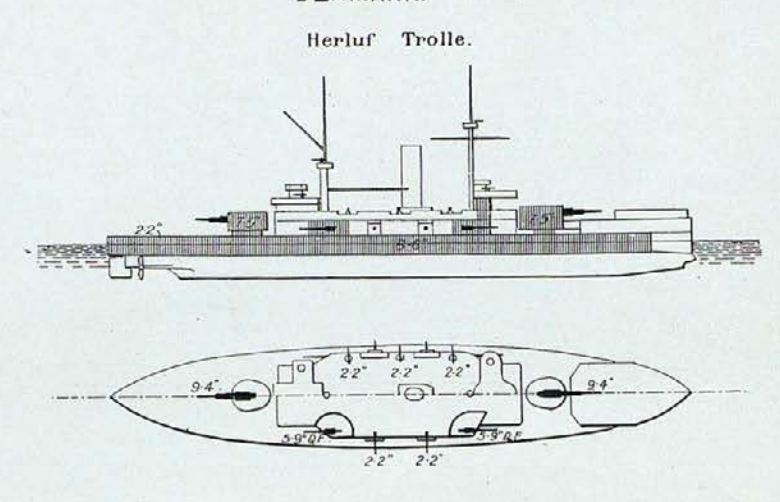

"Esmeralda".
2"
6
6"QF 6"QF
6"QF
6"QF
6"QF
6"QF
6"QF 6"QF
8"QF
8"QF
3"QF
3"QF
3"QF
3"QF

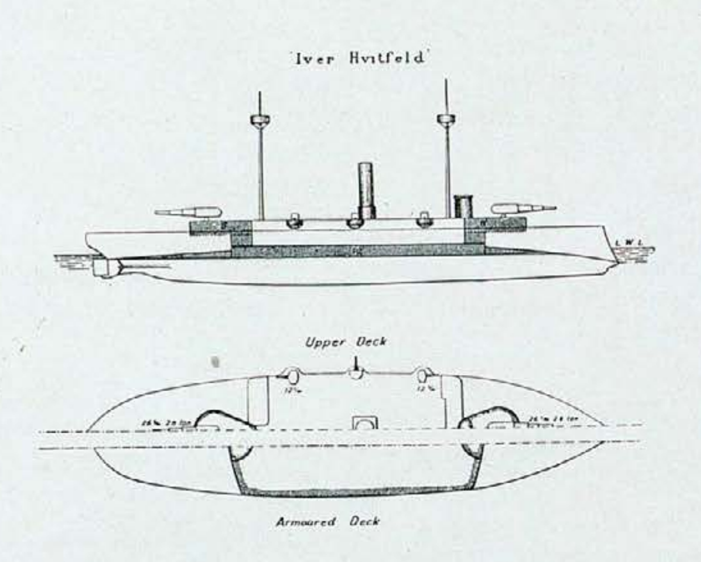
CHILI.





DENMARK.





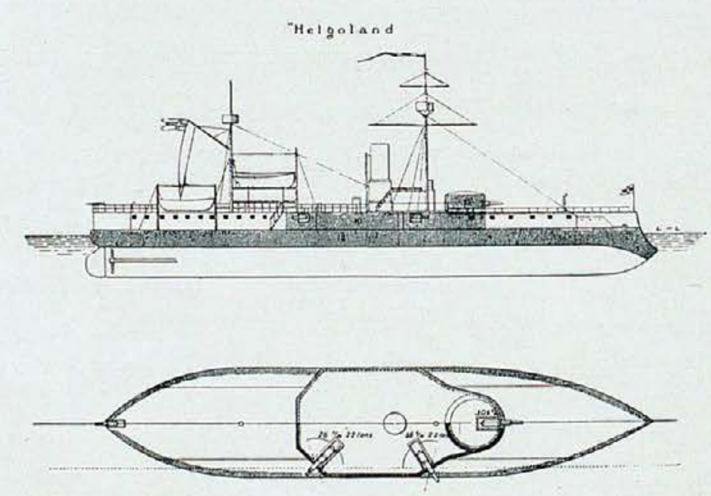


PLATE 26.

FRANCE

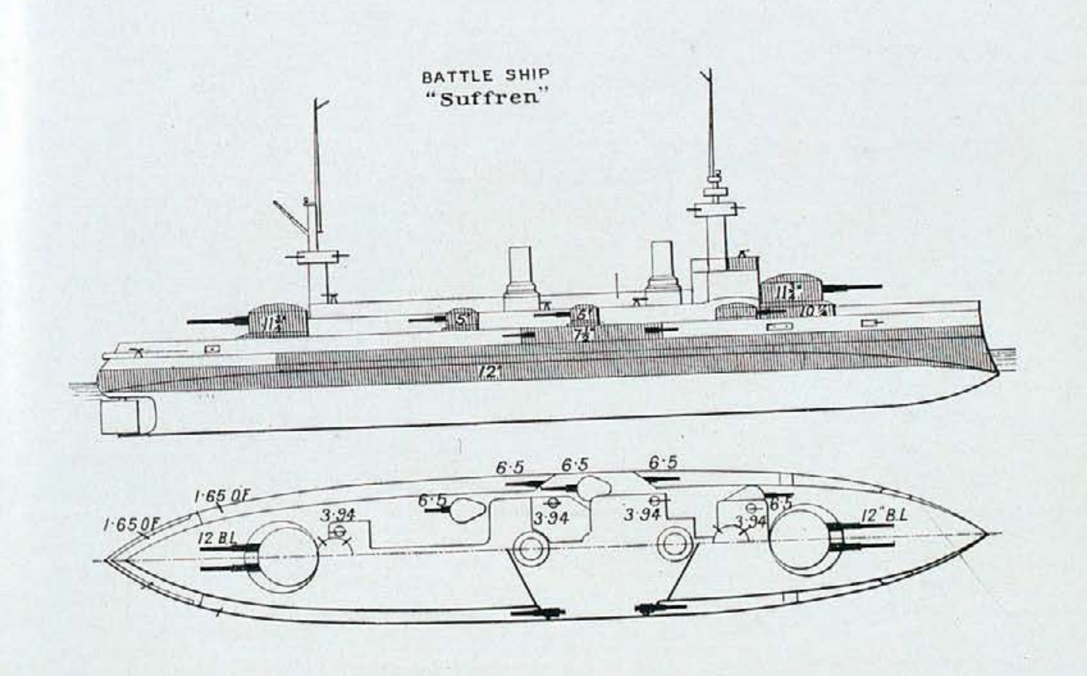
"République."

"Patrie"

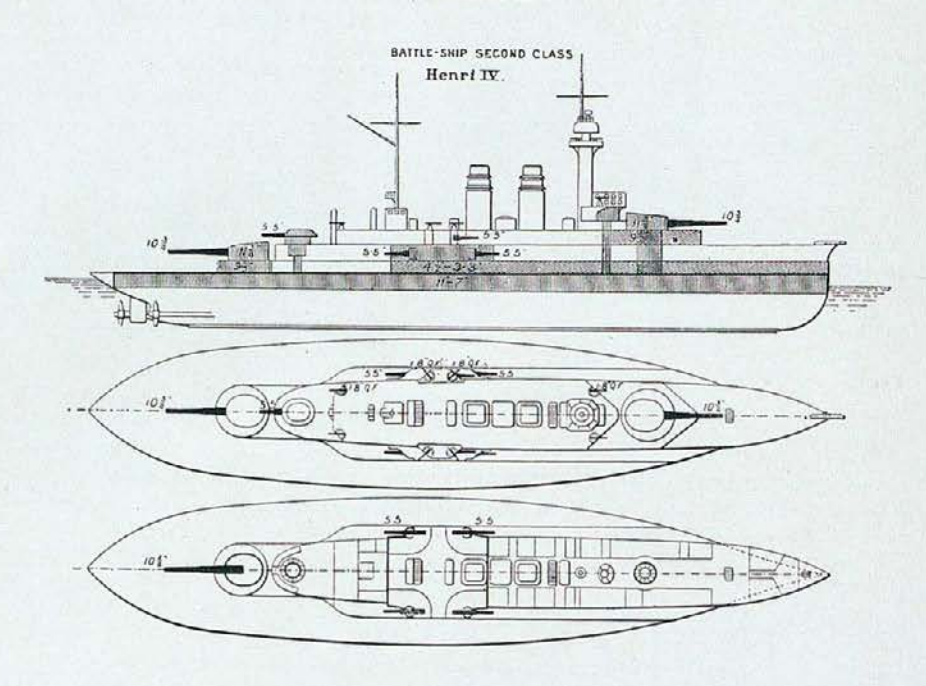
12" 6.4" QF 6.4" QF 6.4" QF 6.4" QF 6.4" QF 12" 1.8" 1.8" 1.8" 1.8" 1.8" 1.8 1.8 1.8" 1.8" 1.8"

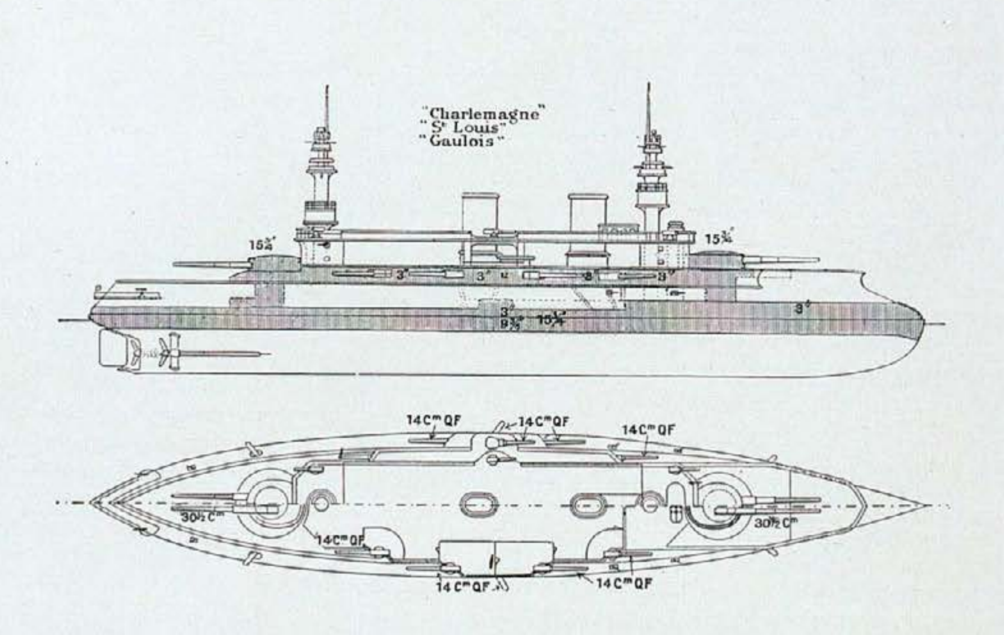
BATTLE SHIP

"Suffren"



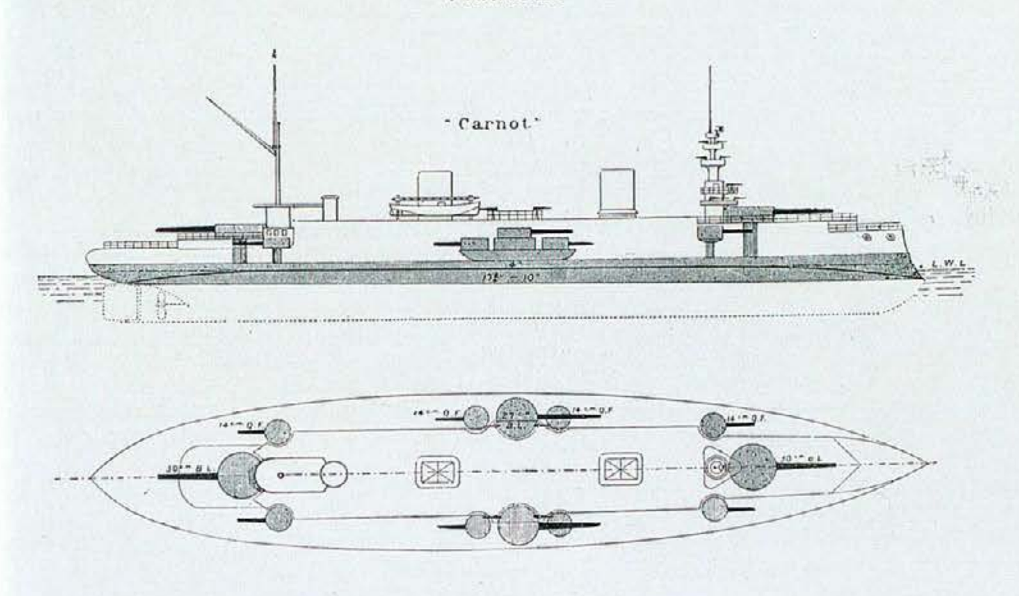
FRANCE.


BATTLE-SHIP SECOND CLASS
Henri IV.

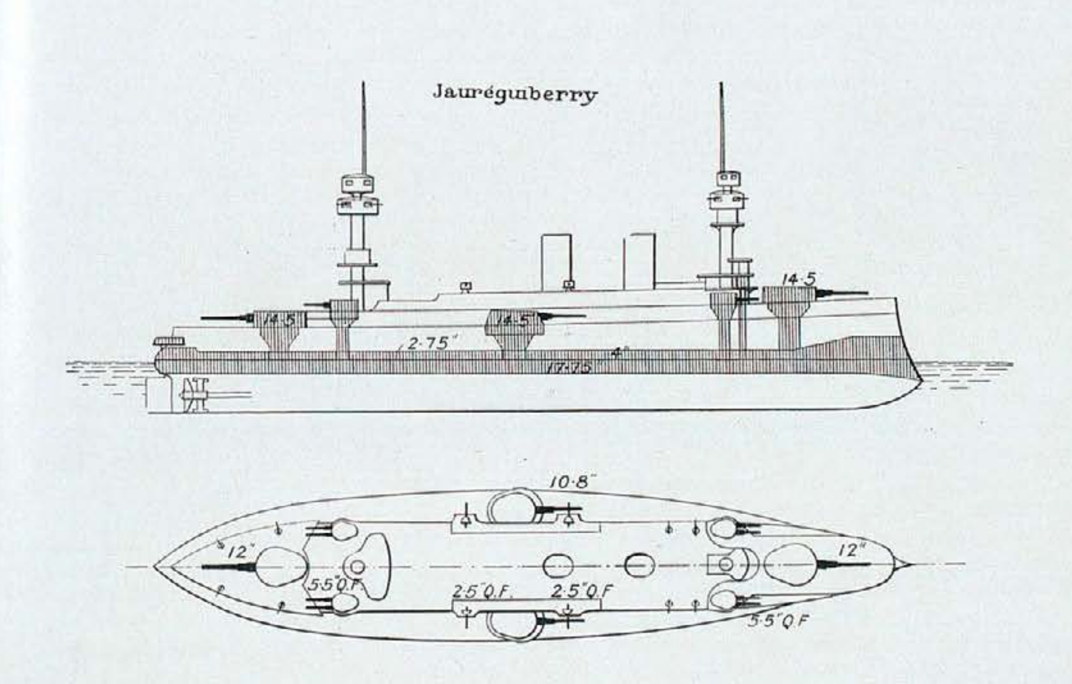

"Charlemagne"
"St Louis"
"Gaulois"
15¾"
15¾"
3"
14 Cm QF
14 Cm QF
14 Cm QF
14 Cm QF
14 Cm QF
14 Cm QF
30½ Cm
30½ Cm

FRANCE.

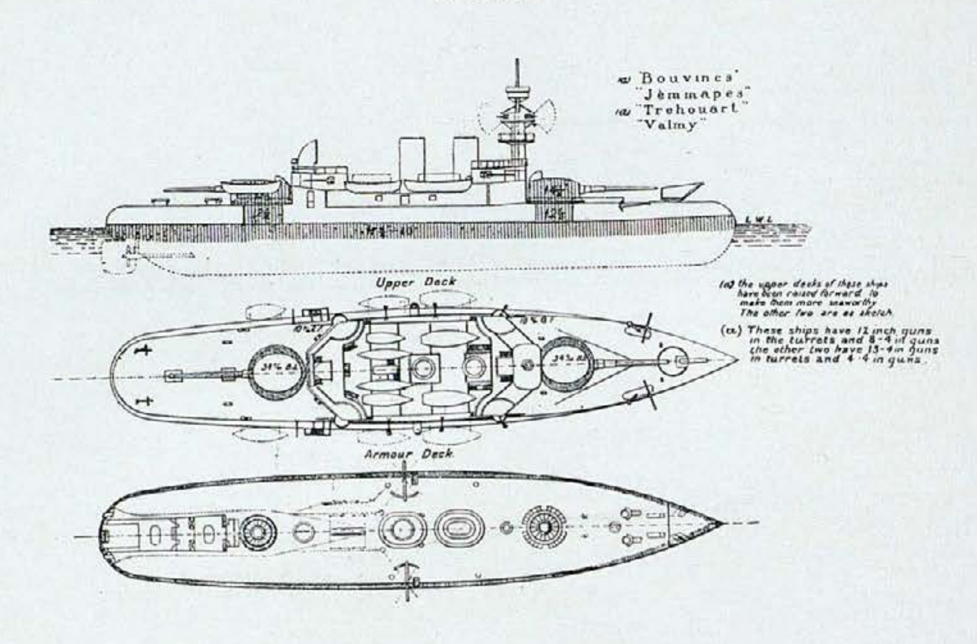
"Carnot."

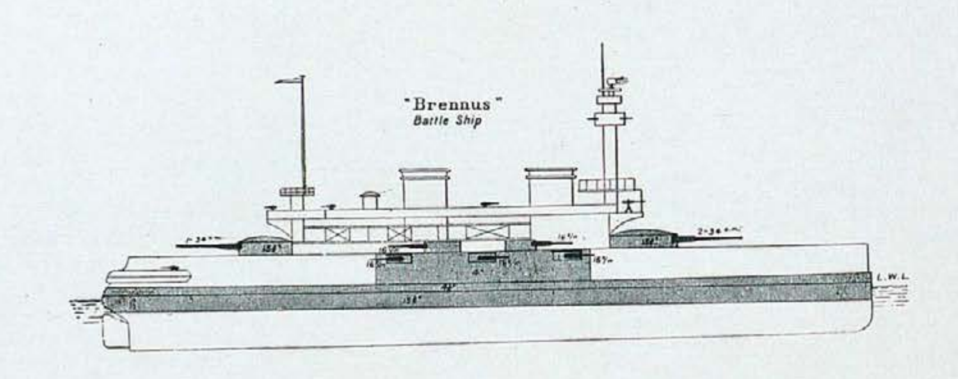


Jauréguberry



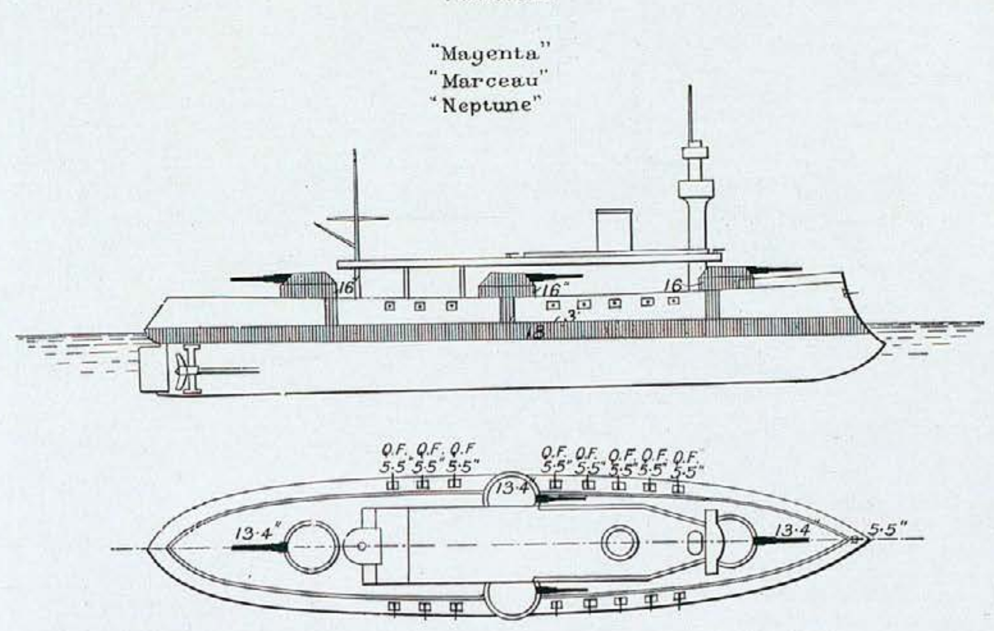
FRANCE.


(a) "Bouvines"
"Jemmapes"
(a) "Trehouart"
"Valmy"
L.W.L.
Upper Deck
Armour Deck
(a) the upper decks of these ships have been raised forward to make them more seaworthy. The other two are as sketch.
(α) These ships have 12 inch guns in the turrets and 8-4 in guns the other two have 13-4 in guns in turrets and 4·4 in guns.

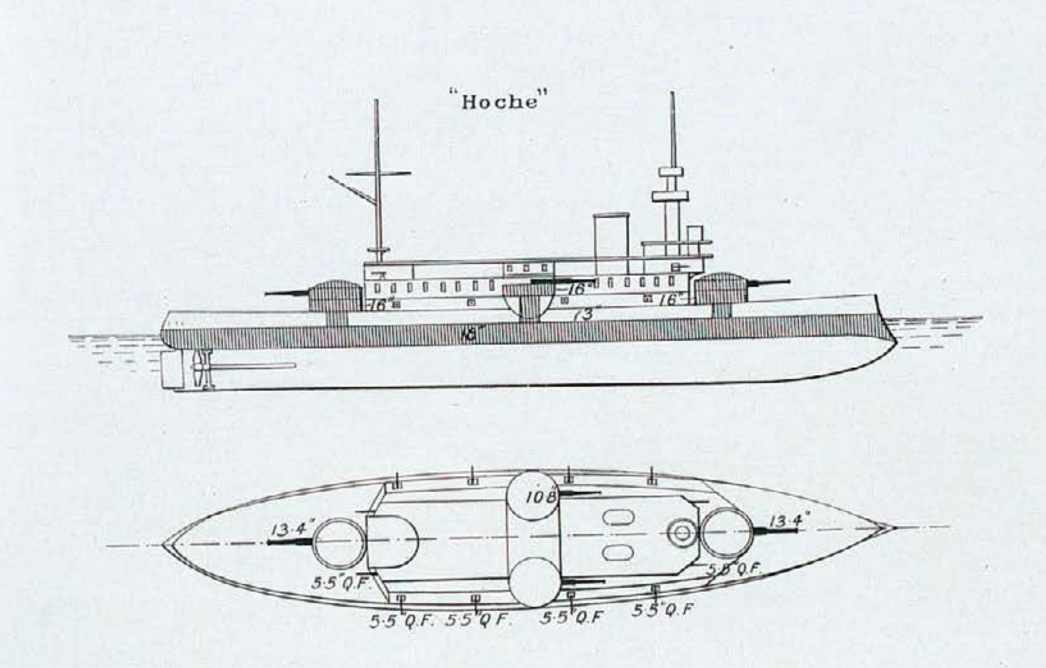

"Brennus"
Battle Ship
L.W.L.

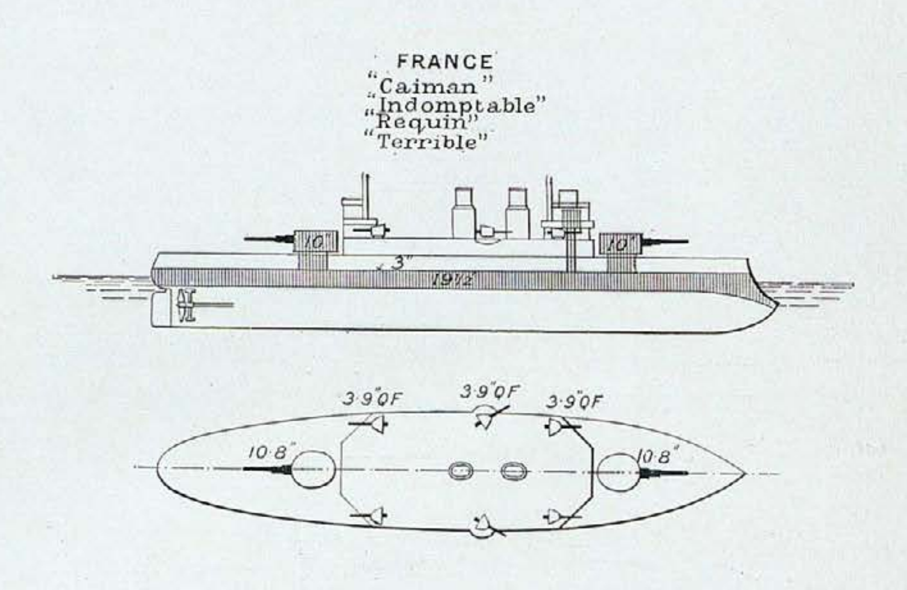
FRANCE.

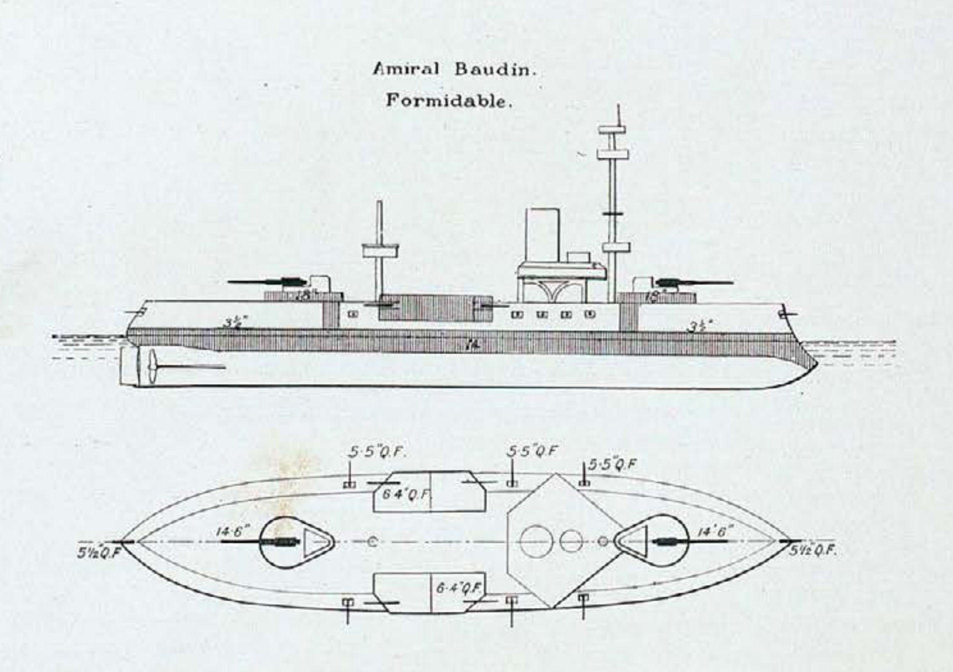
"Magenta"
"Marceau"
"Neptune"



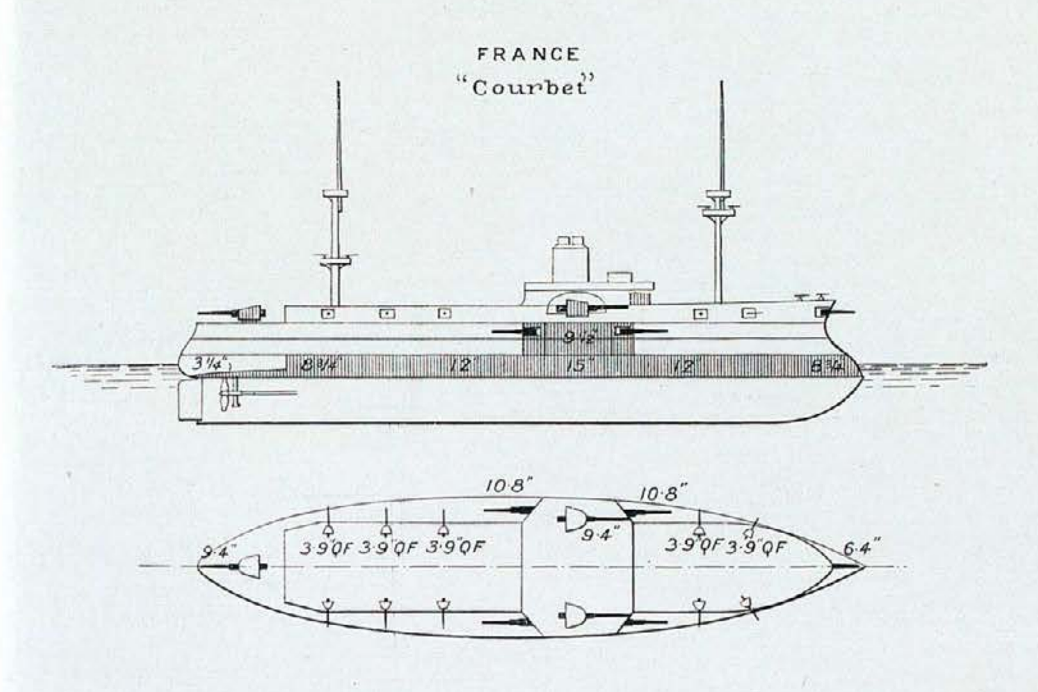
"Hoche"




FRANCE
"Caiman"
"Indomptable"
"Requin"
"Terrible"
10"
10"
3"
19½"
3·9" QF
3·9" QF
3·9" QF
10·8"
10·8"


Amiral Baudin.
Formidable.
18"
18"
3½"
3½"
14
5·5" Q.F.
5·5" Q.F
5·5" Q.F
6·4" Q.F
6·4" Q.F.
14·6"
14·6"
5½" Q.F
5½" Q.F.

FRANCE.

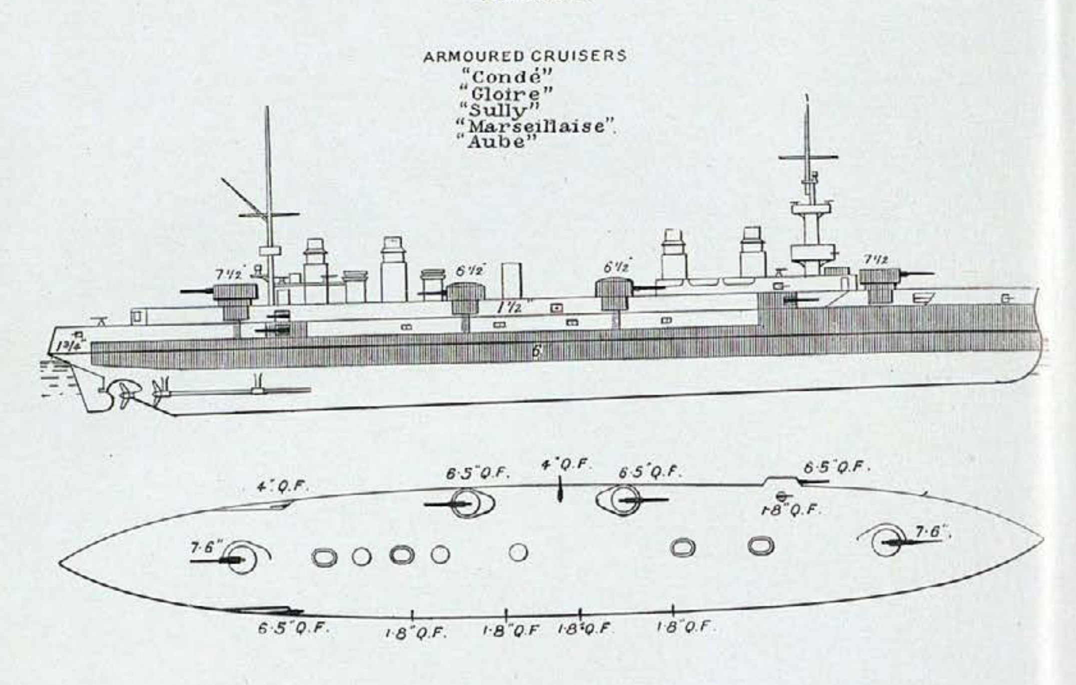


Jules Ferry
Léon Gambetta
Victo Hugo

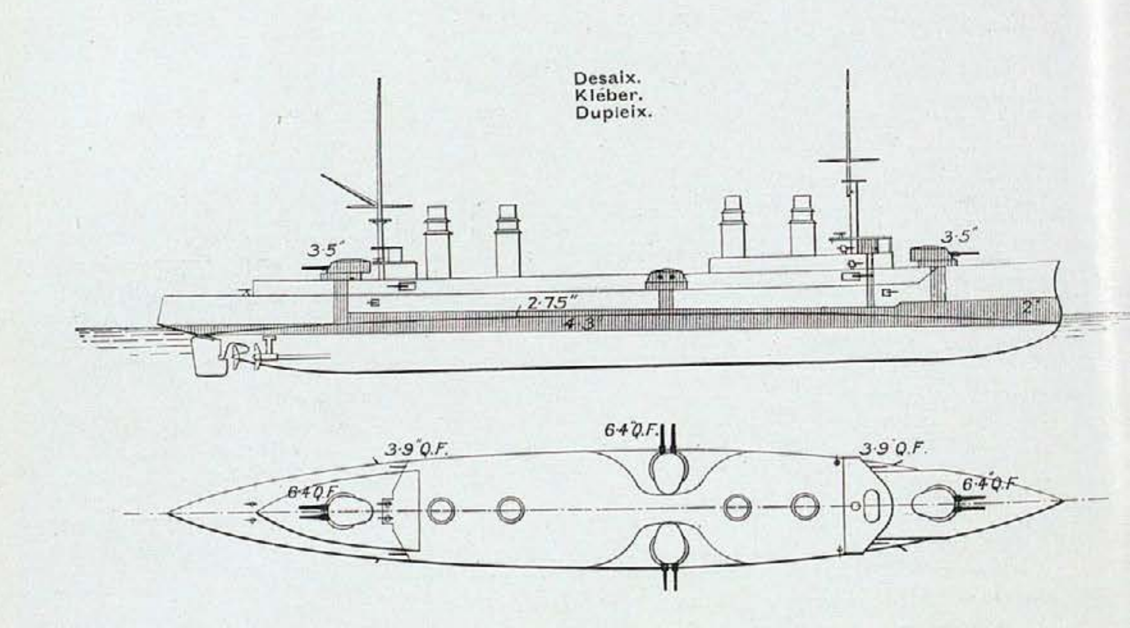
PLATE 33.
d

FRANCE.

ARMOURED CRUISERS
"Condé"
"Gloire"
"Sully"
"Marseillaise".
"Aube"

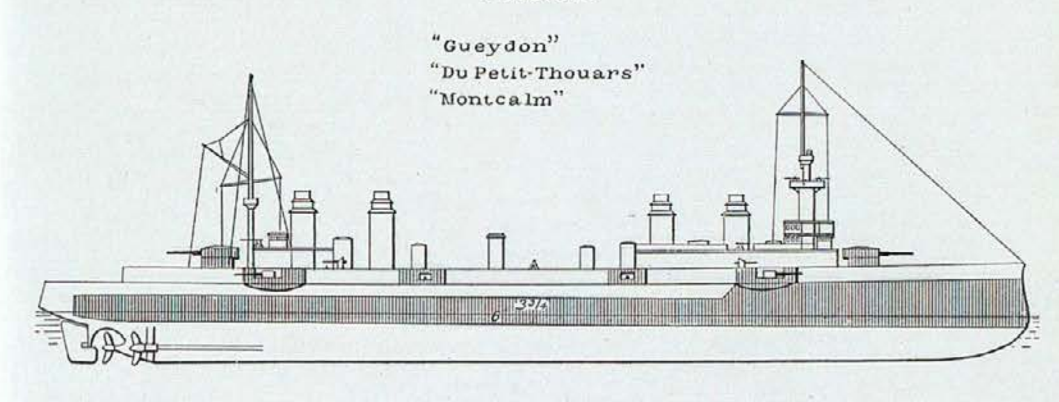


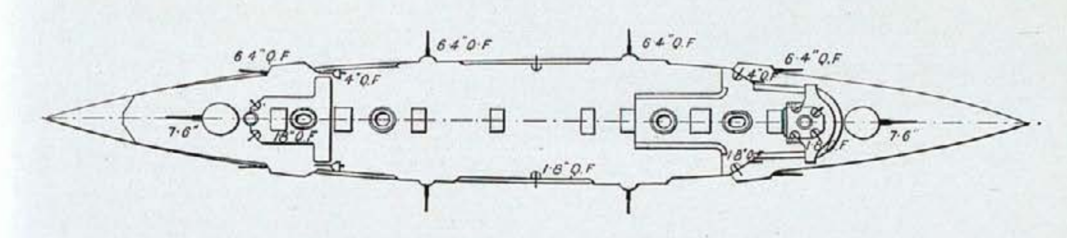
Desaix.
Kléber.
Dupleix.



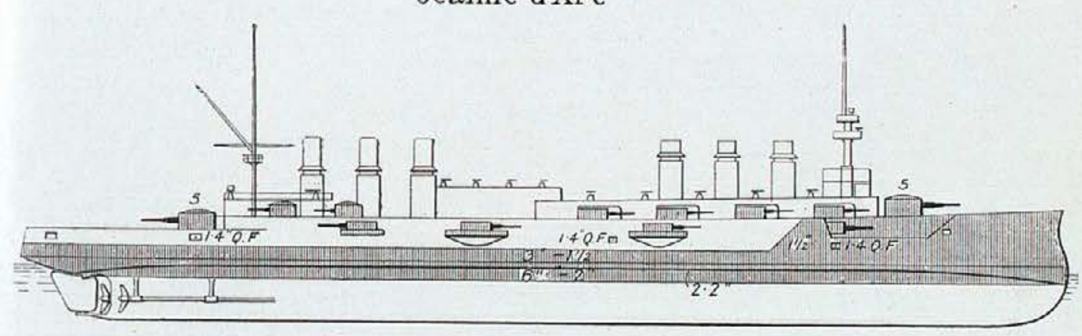
FRANCE.

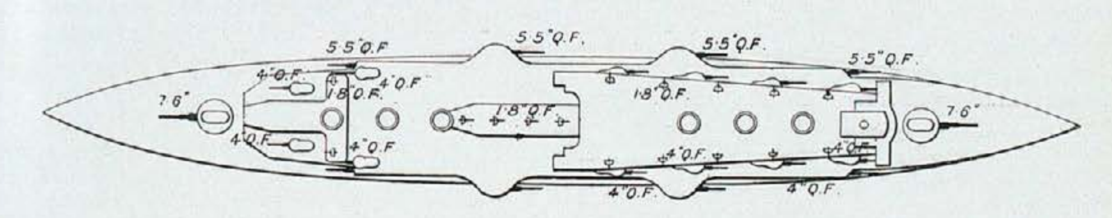
"Gueydon"
"Du Petit-Thouars"
"Montcalm"



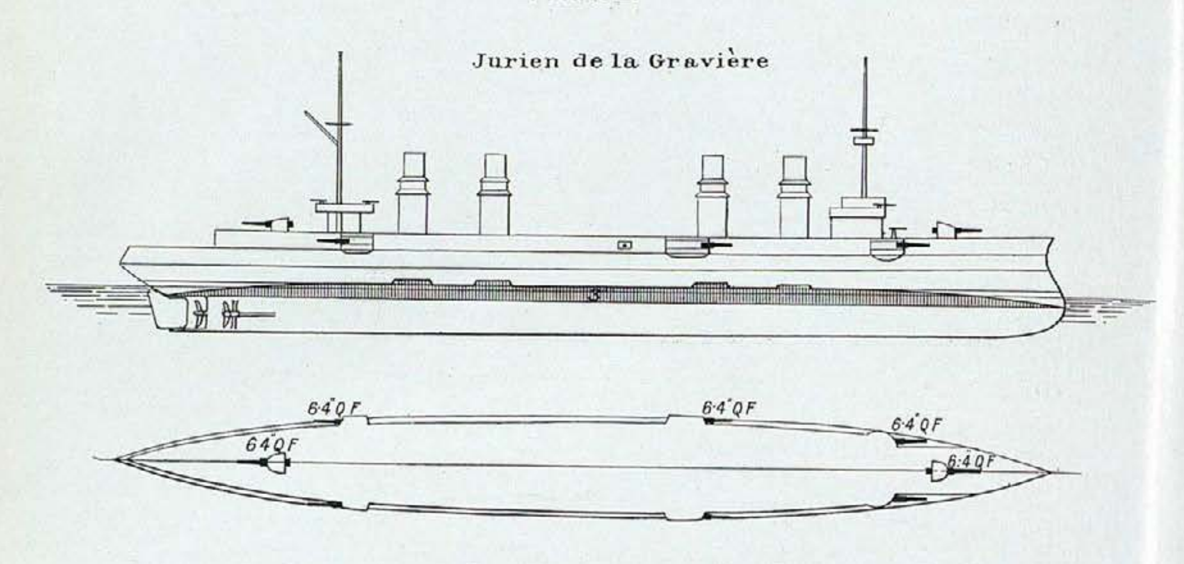


ARMOURED CRUISER.
"Jeanne d'Arc"

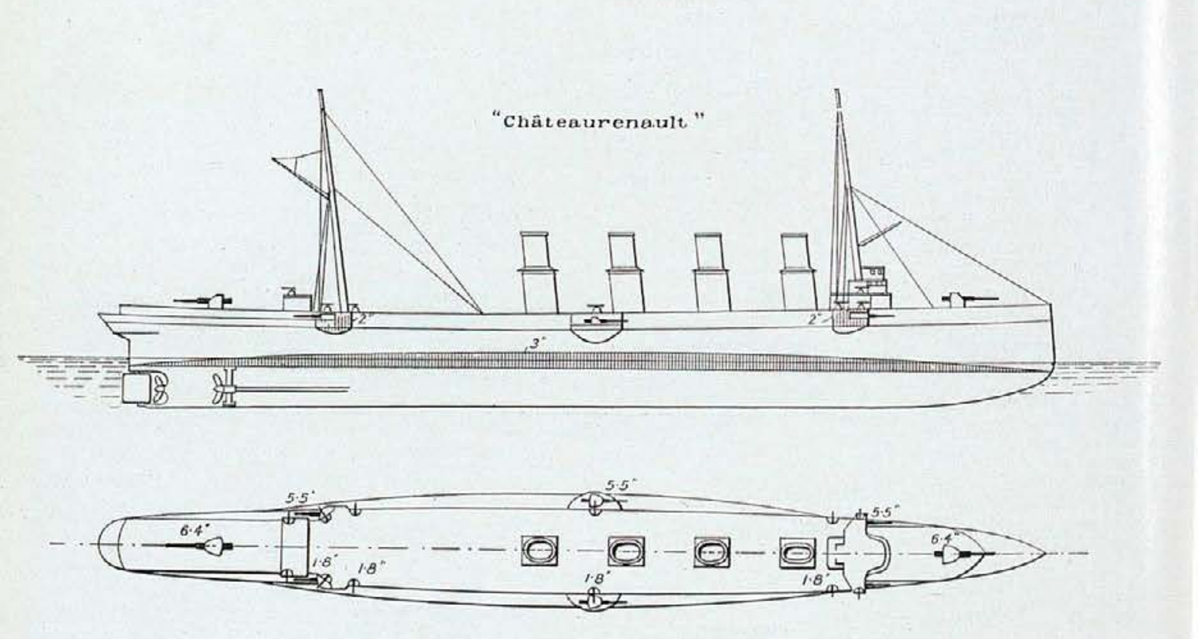




FRANCE.



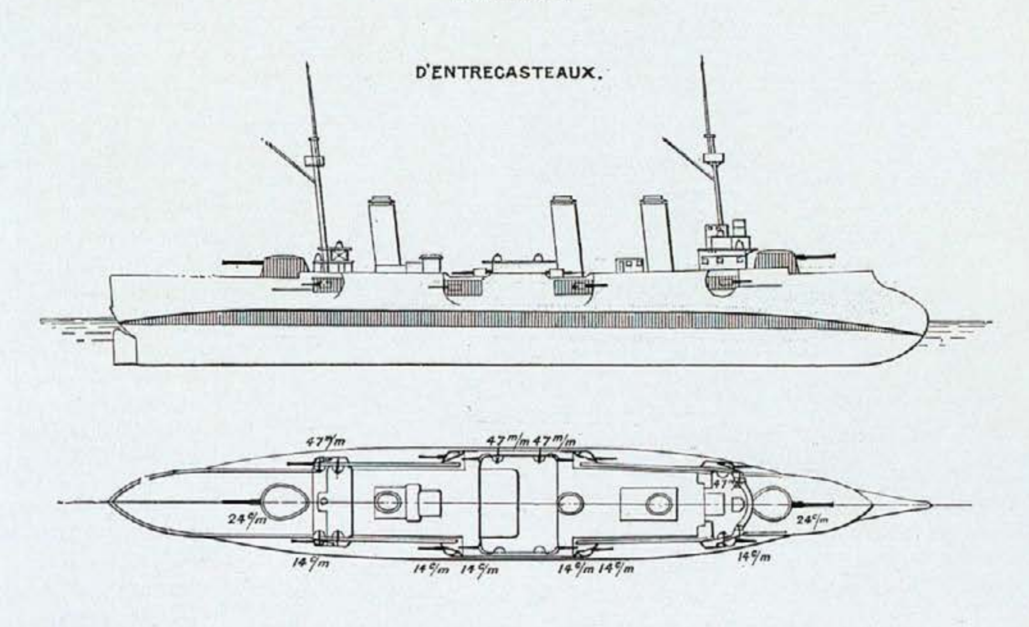
Jurien de la Gravière
3
6·4" Q F
6·4" Q F
6·4" Q F
6·4" Q F
6·4" Q F



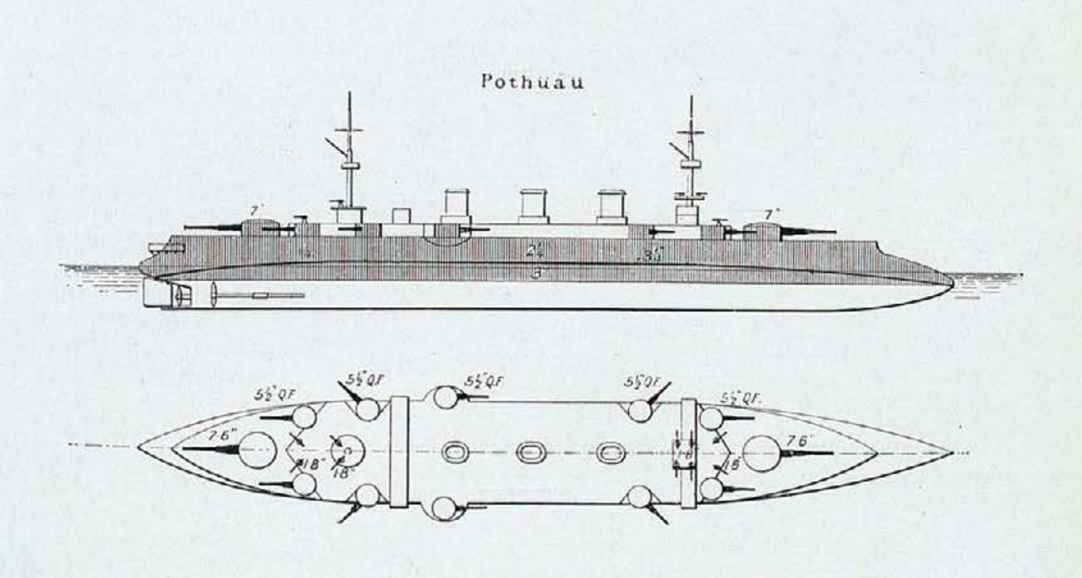
"Châteaurenault"
2"
2"
3"
5·5"
5·5"
5·5"
6·4"
6·4"
1·8"
1·8"
1·8"
1·8"

FRANCE.

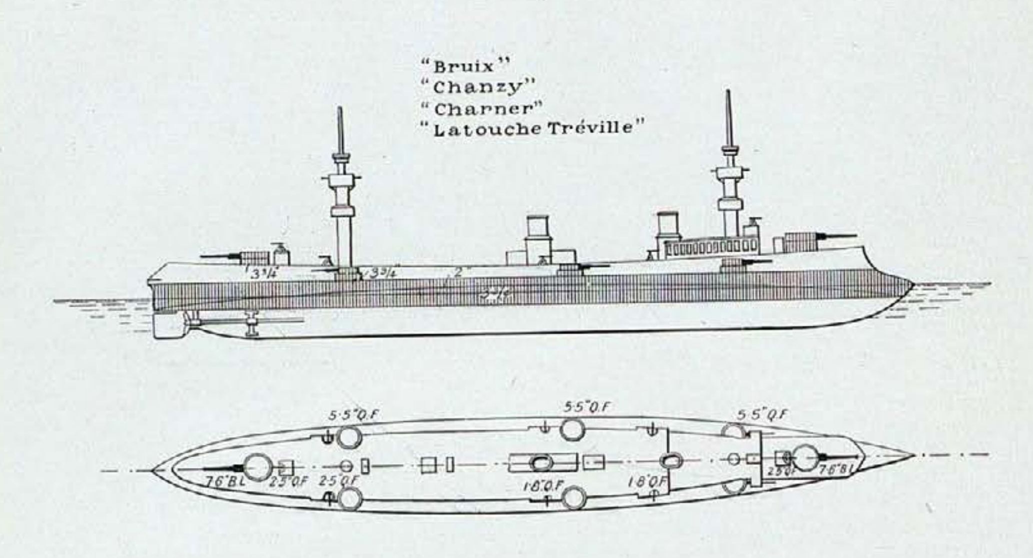
D'ENTRECASTEAUX.

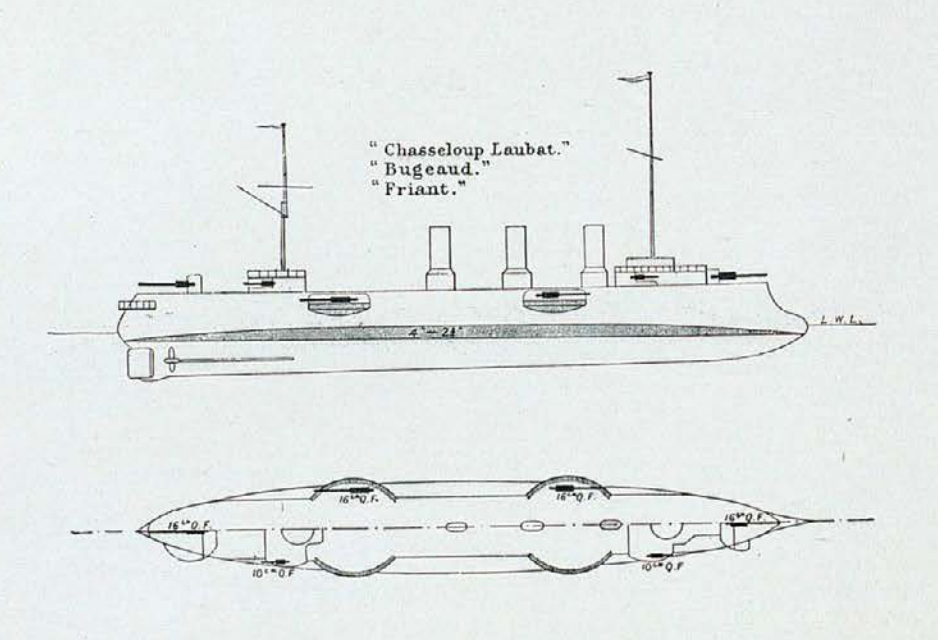


Pothuau

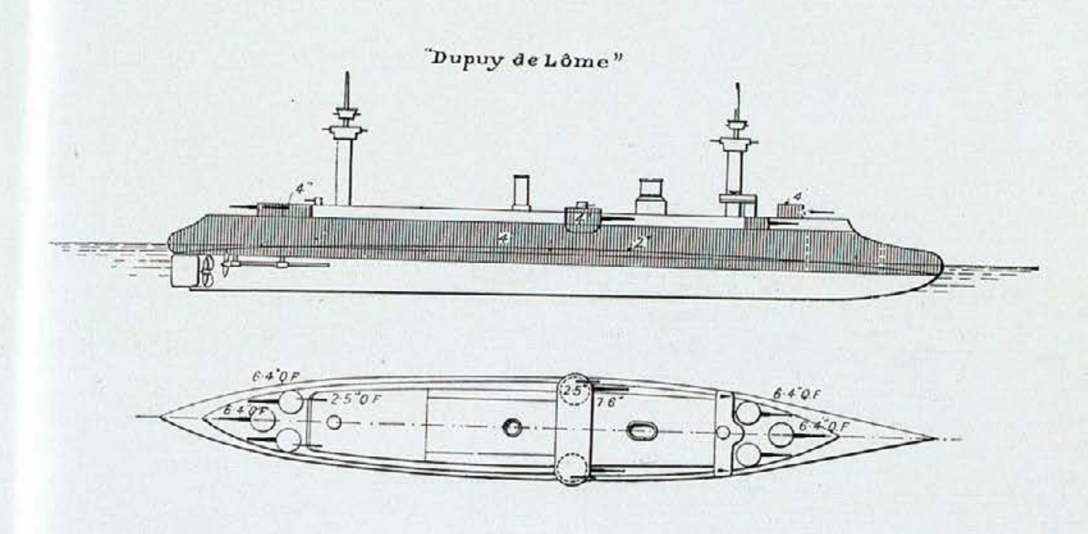


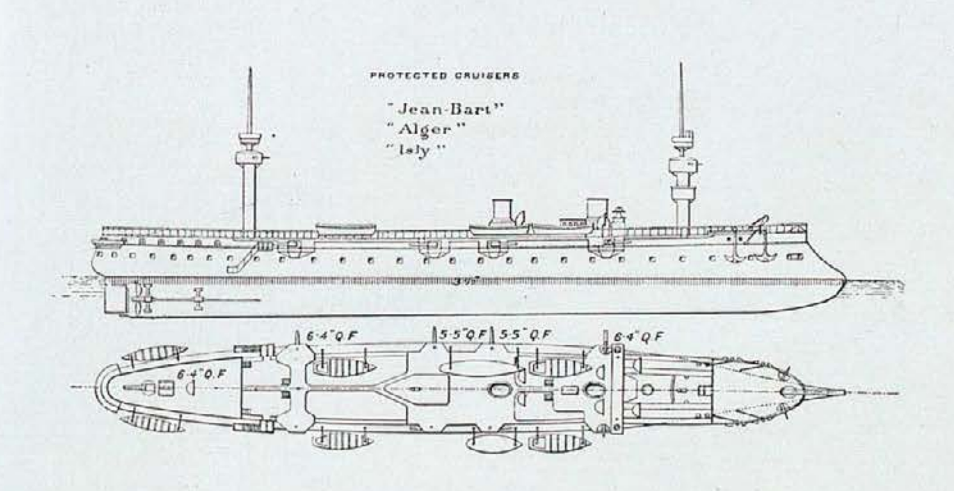
FRANCE.


"Bruix"
"Chanzy"
"Charner"
"Latouche Tréville"
5·5" Q.F
7·6" B.L
2·5" Q.F
1·8" Q.F

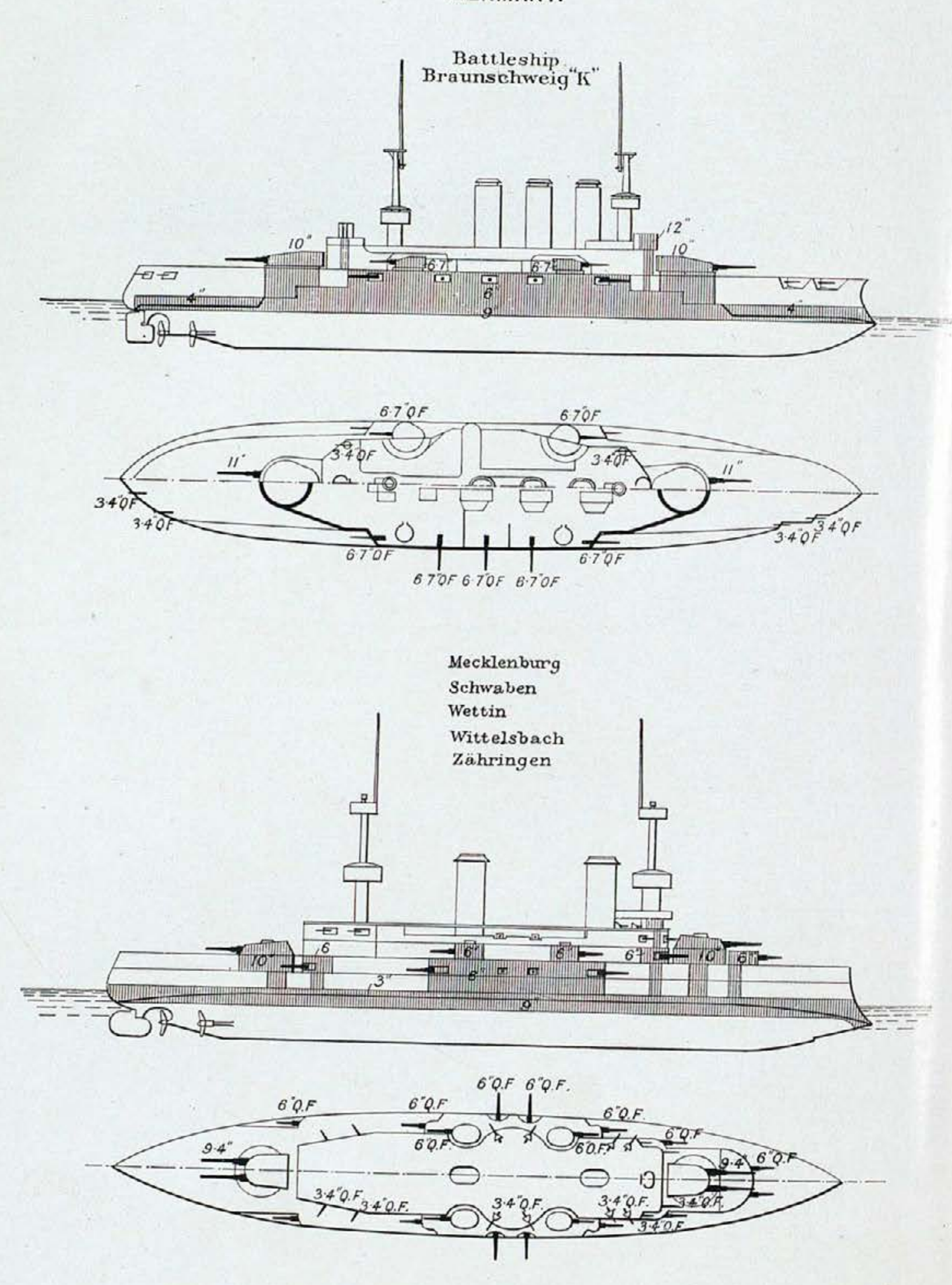

"Chasseloup Laubat."
"Bugeaud."
"Friant."
L.W.L.

FRANCE.

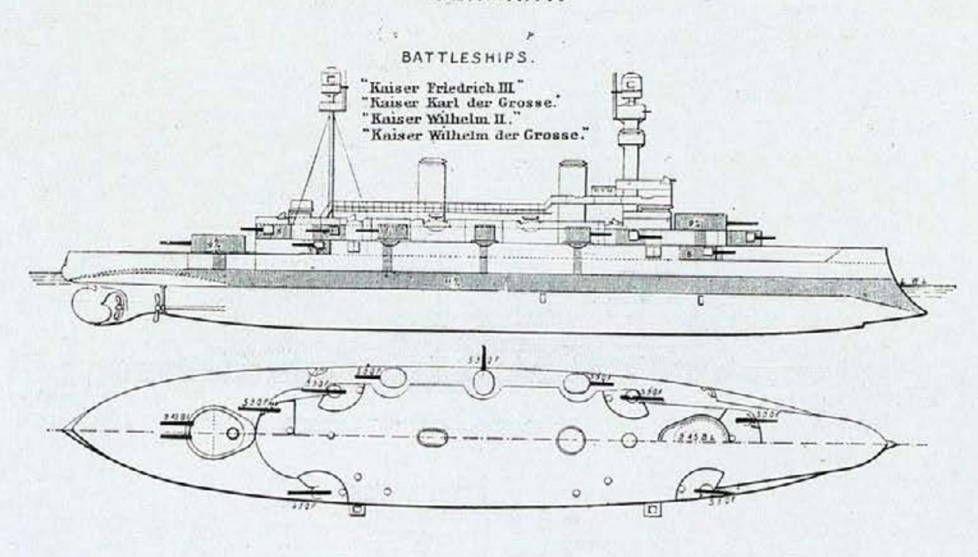

"Dupuy de Lôme"
6·4" Q.F
2·5" Q.F
6·4" Q.F
6·4" Q.F


PROTECTED CRUISERS
"Jean-Bart"
"Alger"
"Isly"
6·4" Q.F
5·5" Q.F
5·5" Q.F
6·4" Q.F
6·4" Q.F

GERMANY.


Battleship
Braunschweig "K"
10"
12"
10"
6·7"
6"
9"
4"
4"
6·7"Q.F
6·7"Q.F
3·4"Q.F
3·4"Q.F
11"
11"
3·4"Q.F
3·4"Q.F
3·4"Q.F
3·4"Q.F
6·7"Q.F
6·7"Q.F
6·7"Q.F 6·7"Q.F 6·7"Q.F
Mecklenburg
Schwaben
Wettin
Wittelsbach
Zähringen
10"
6"
6"
6"
6"
10"
3"
9"
6"Q.F 6"Q.F.
6"Q.F
6"Q.F
6"Q.F.
6"Q.F
9·4"
9·4"
6"Q.F
3·4"Q.F.
3·4"Q.F.
3·4"Q.F.
3·4"Q.F.
3·4"Q.F.
3·4"Q.F

GERMANY.



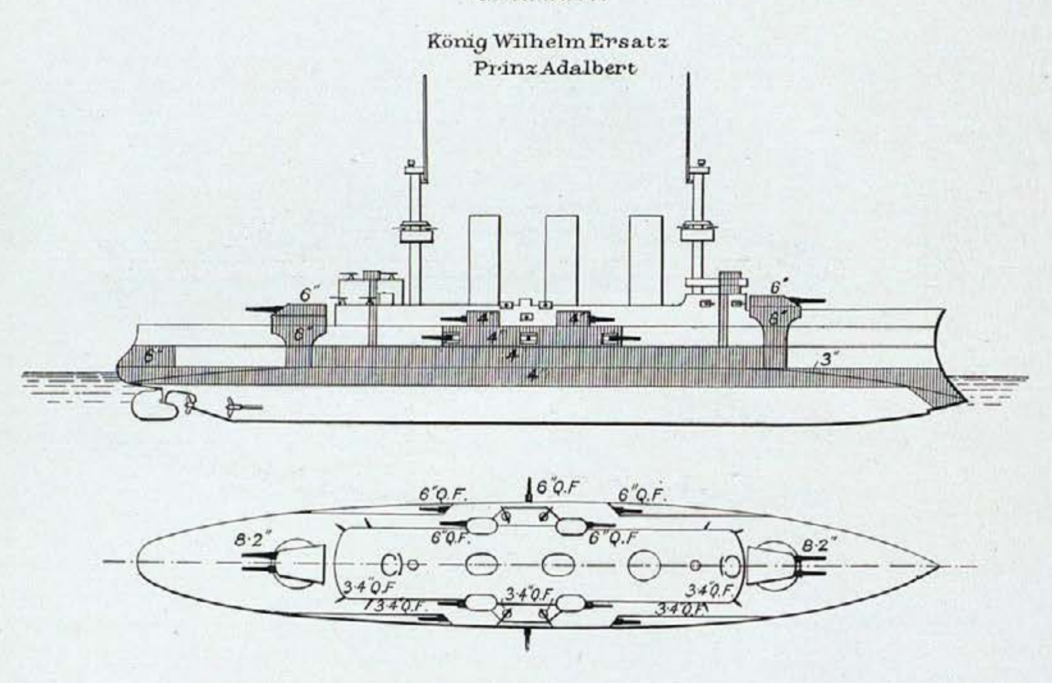
Kürfurst Friedrich Wilhelm.
Brandenburg.
Weissenburg.
Wörth

11·8
11·8
15·7
11·8

11"
3·4"
11"
4·1"
3·4"
11"
3·4

GERMANY.

König Wilhelm Ersatz
Prinz Adalbert



Prinz Heinrich.

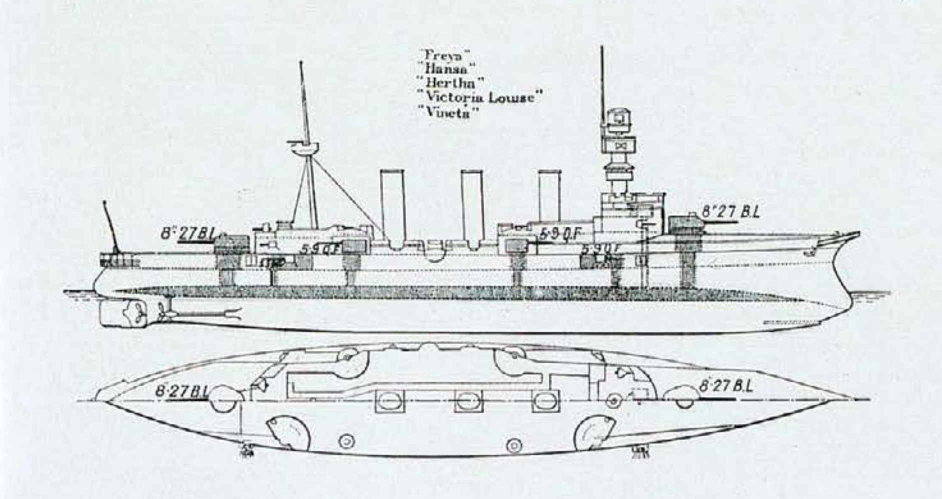
6"
2⅜"
4"

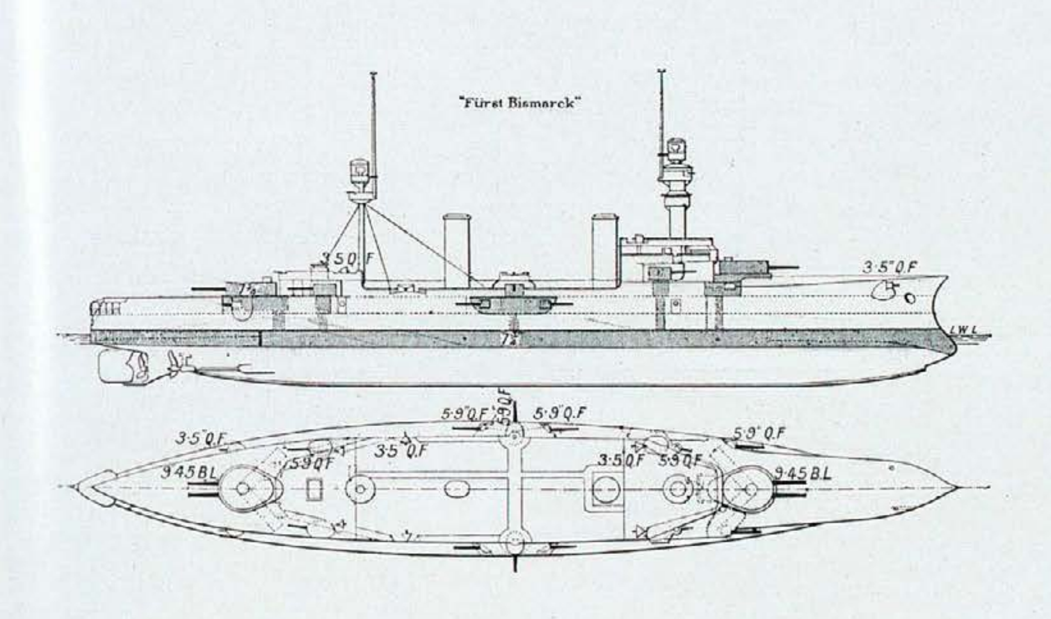
5·9" Q.F 5·9" Q.F 5·9" Q.F 5·9" Q.F 5·9" Q.F

3·4" Q.F 3·4" Q.F

9·4" 9·4"

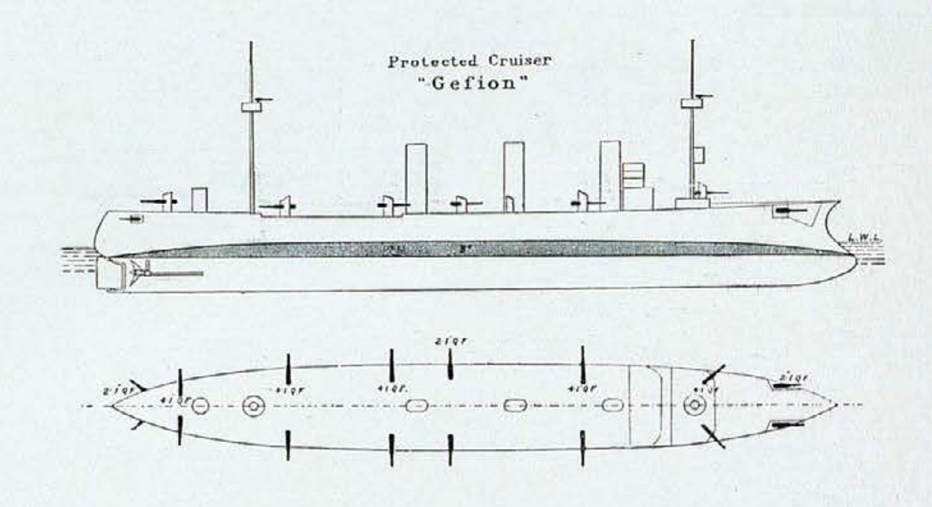
GERMANY.


"Freya"
"Hansa"
"Hertha"
"Victoria Louise"
"Vineta"
8"27 B.L
5·9 Q.F.
8·27 B.L

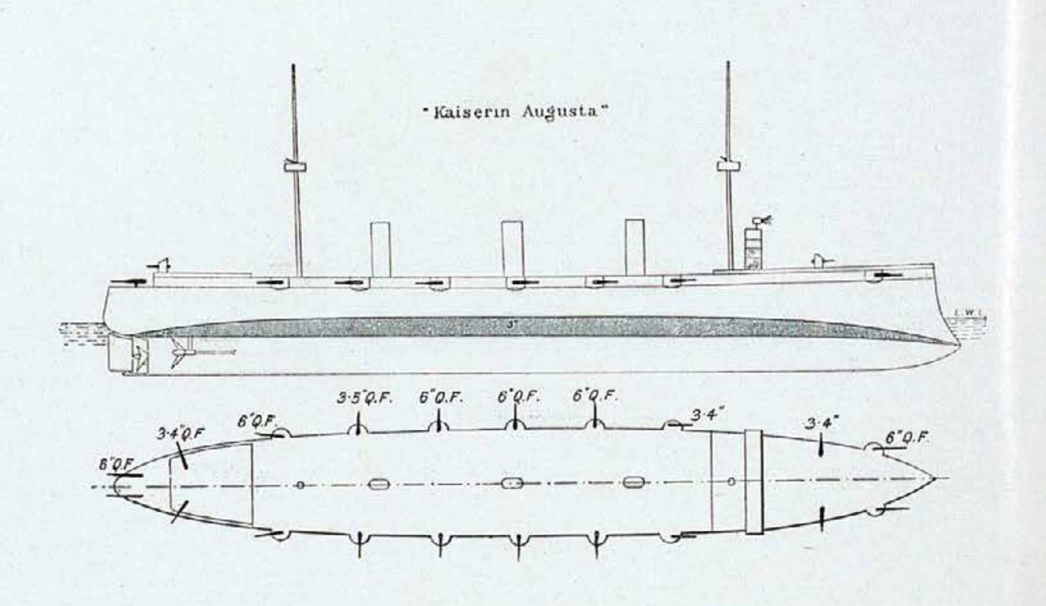

"Fürst Bismarck"
3·5 Q.F
3·5" Q.F
L.W.L
5·9" Q.F
5·9" Q.F
9·45 B.L
3·5" Q.F
3·5 Q.F
5·9 Q.F

GERMANY.

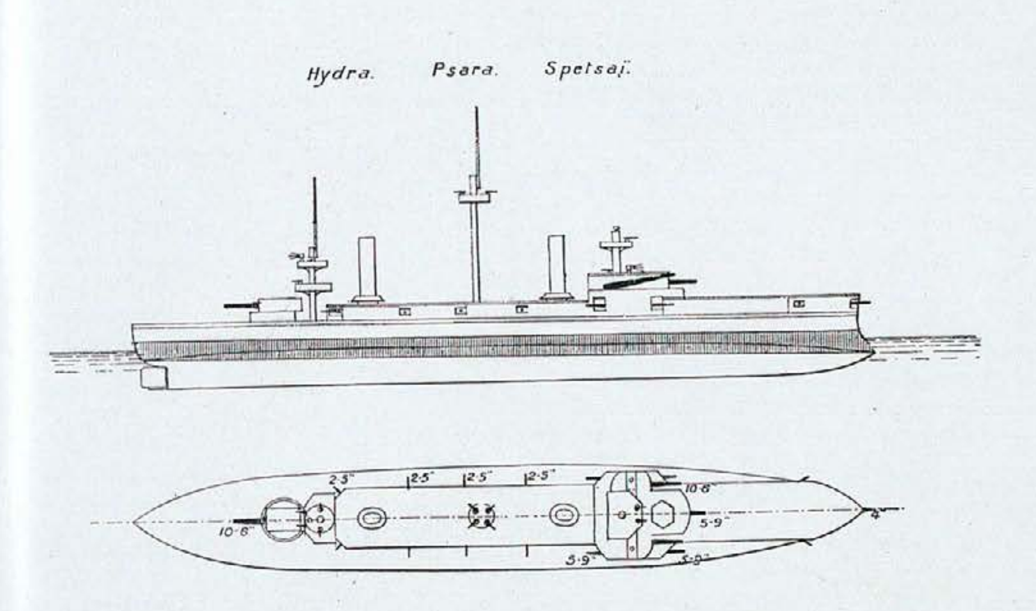
Protected Cruiser
"Gefion"



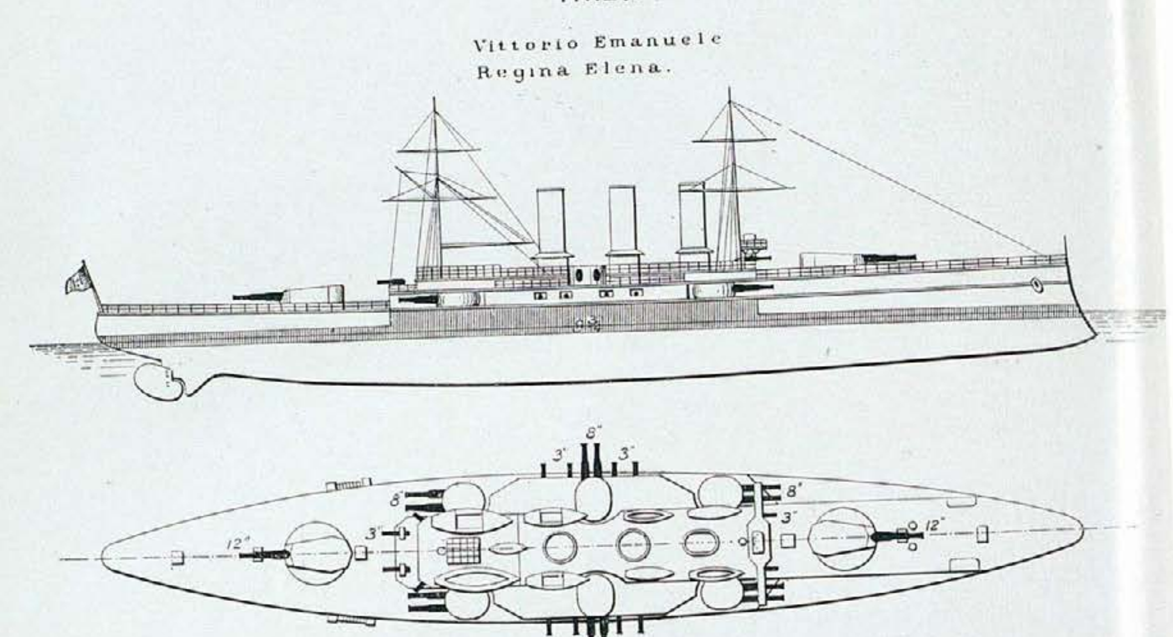
"Kaiserin Augusta"



GREECE.

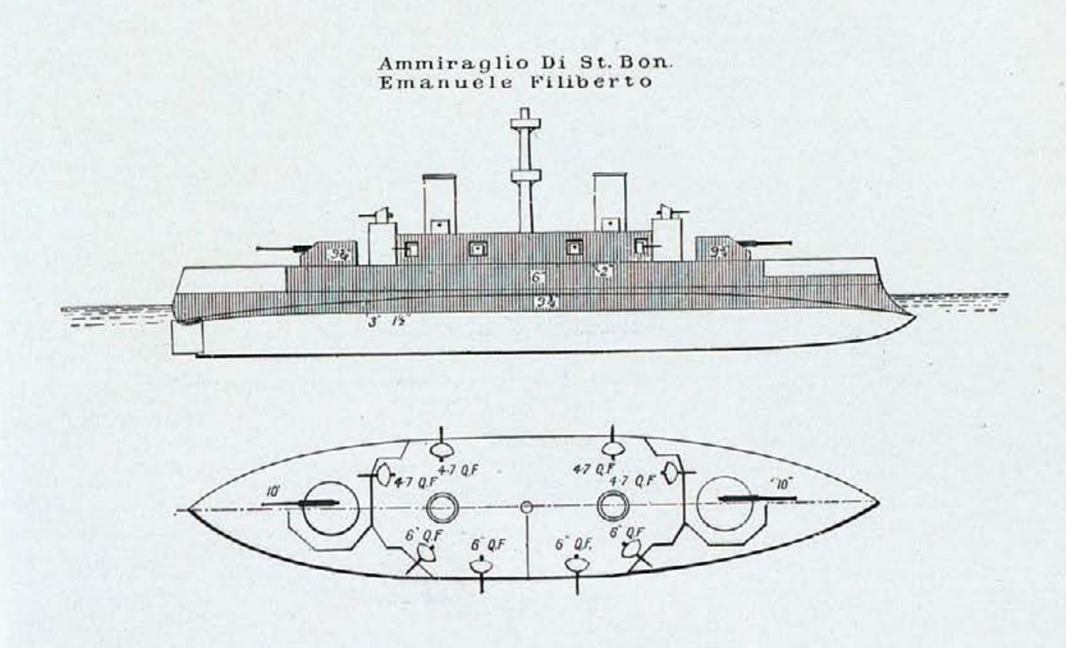


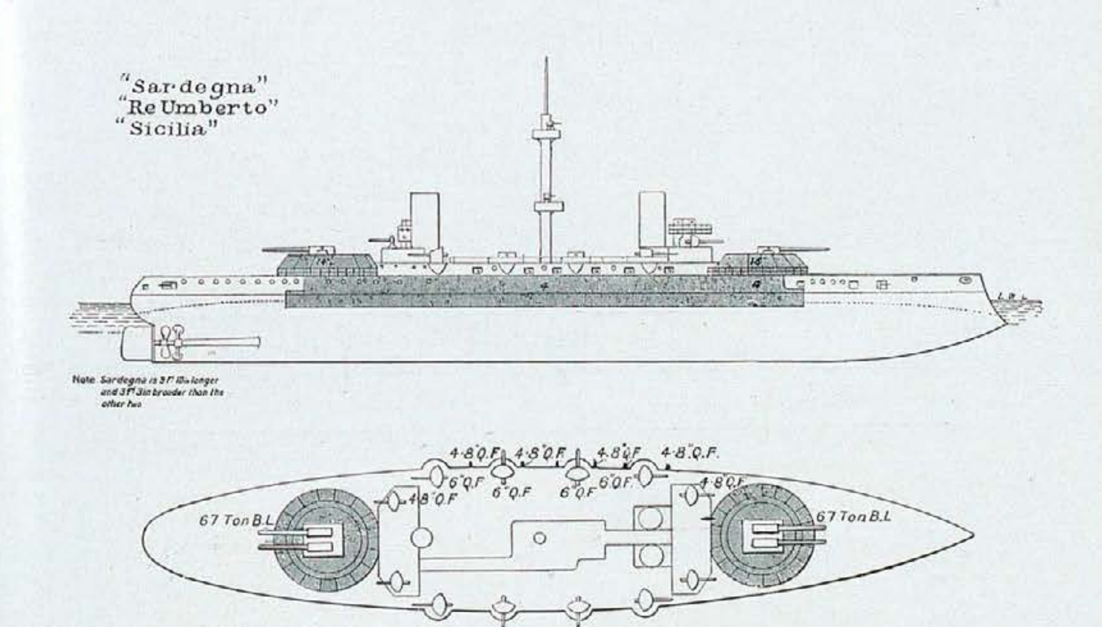
ITALY.



Benedetto Brin.
Regina Margherita.

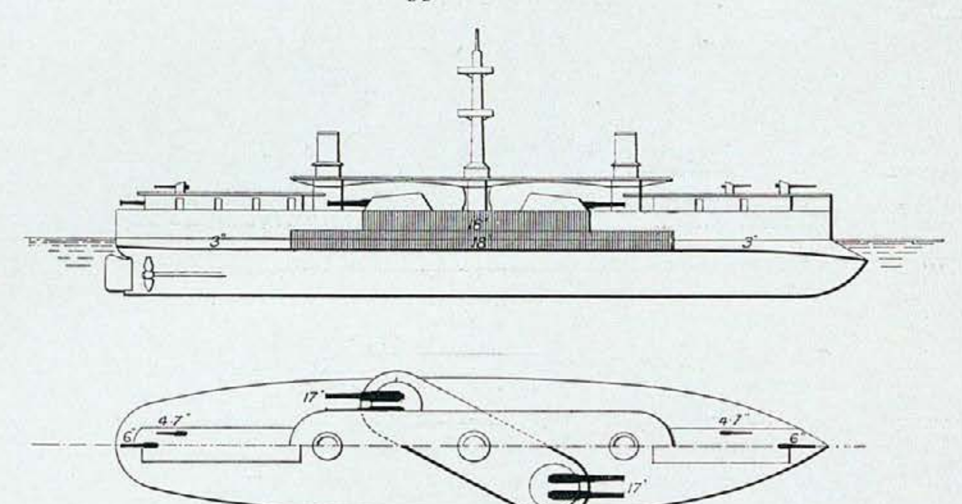
ITALY.


Ammiraglio Di St. Bon.
Emanuele Filiberto
9¾
9¾
6
2
9¾
3
1½
10
10
4·7 Q.F
4·7 Q.F
4·7 Q.F
4·7 Q.F
6 Q.F
6 Q.F
6 Q.F
6 Q.F


"Sardegna"
"Re Umberto"
"Sicilia"
14
14
4
4
Note Sardegna is 3 Ft 10 in longer and 3 Ft 3 in broader than the other two
4·8 Q.F
4·8 Q.F
4·8 Q.F
4·8 Q.F
4·8 Q.F
4·8 Q.F
6 Q.F
6 Q.F
6 Q.F
6 Q.F
67 Ton B.L
67 Ton B.L

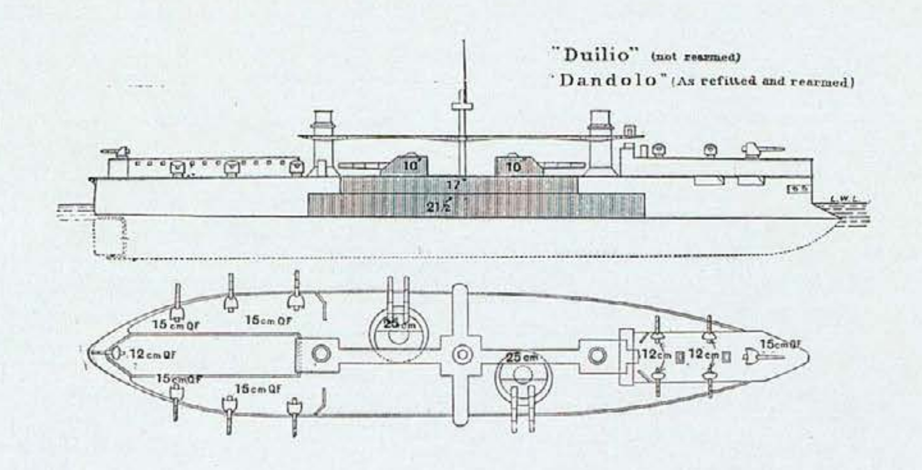
ITALY.

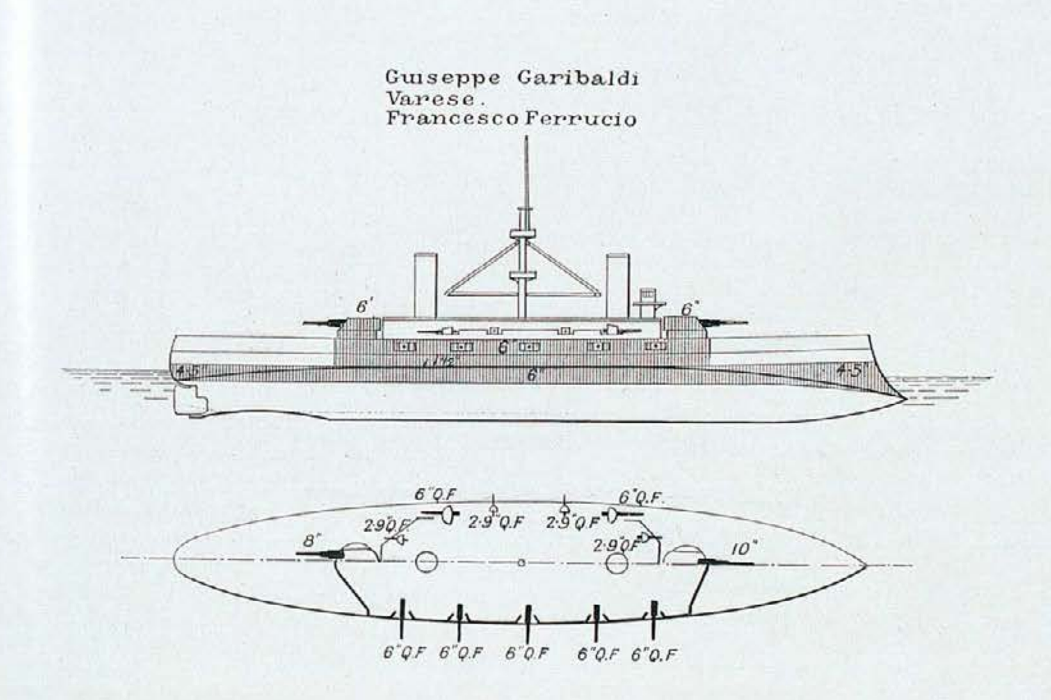
Andrea Doria.
Francesco Morosini.
Ruggiero di Lauria.



Italia.
Lepanto.

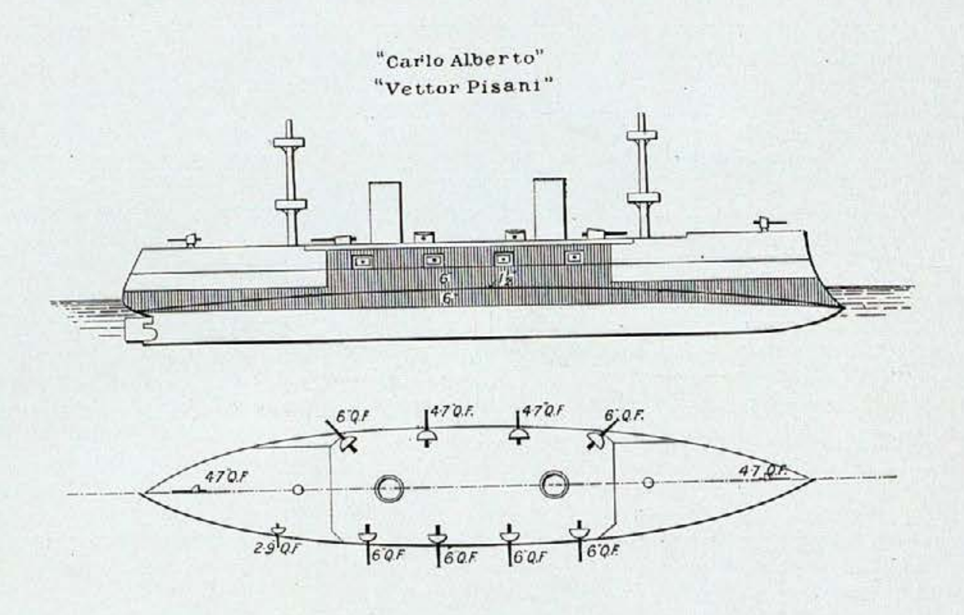
19"
16"
3"
6"
6"
6"
17"
6
6"
4·7"


"Duilio" (not rearmed)
"Dandolo" (As refitted and rearmed)
10"
10"
17"
21½"
15 cm QF
15cm QF
12cm QF
15cm QF
15cm QF
25cm
25cm
12cm
12cm
15cm QF
L.W.L.

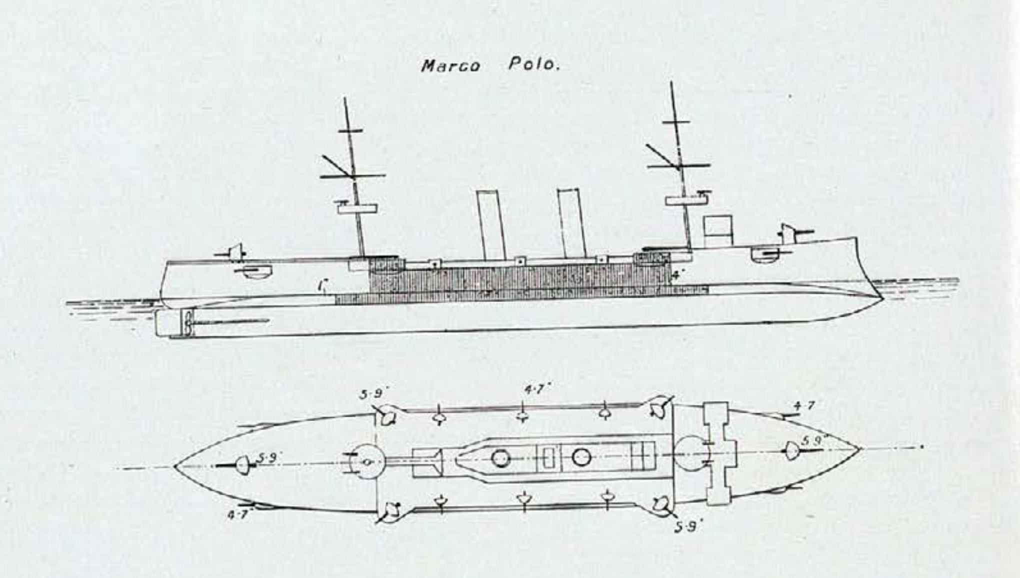

Guiseppe Garibaldi
Varese.
Francesco Ferrucio
6"
6"
6"
1½"
6"
4·5"
4·5"
6"Q.F
6"Q.F.
2·9"Q.F
2·9"Q.F
2·9"Q.F
2·9"Q.F
8"
10"
6"Q.F 6"Q.F 6"Q.F 6"Q.F 6"Q.F

ITALY.

"Carlo Alberto"
"Vettor Pisani"

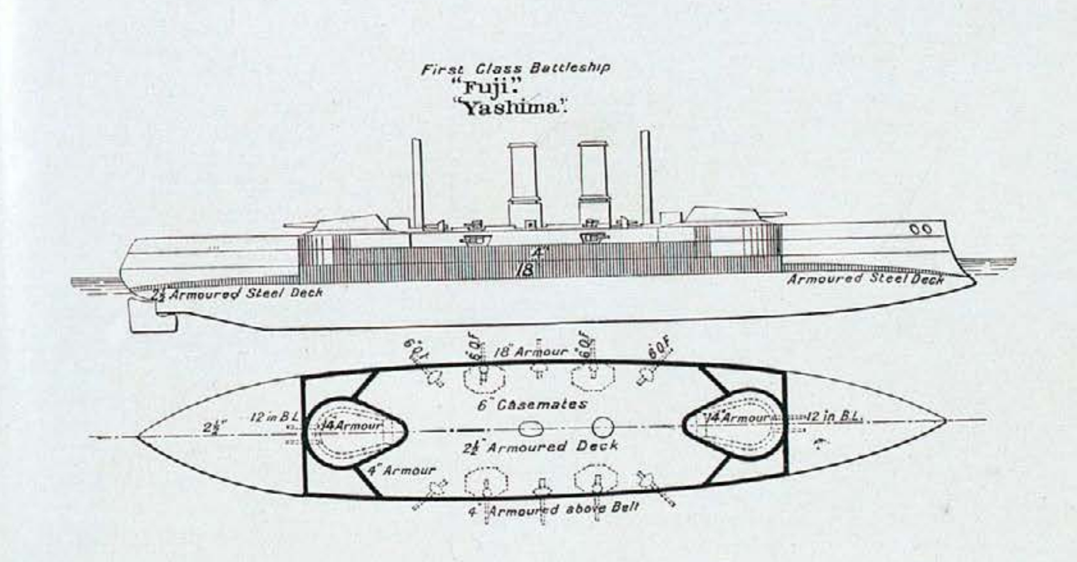


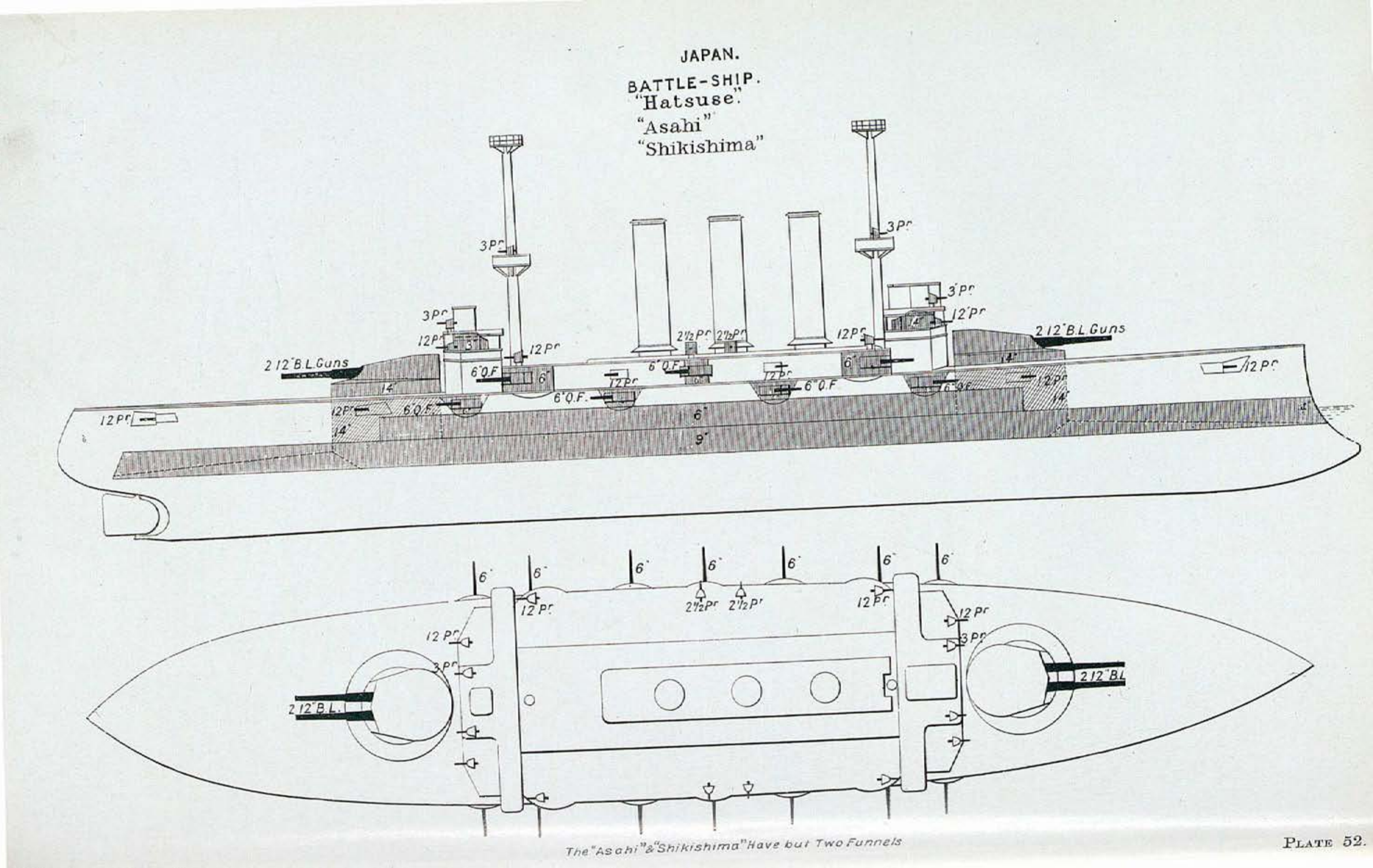
Marco Polo.



JAPAN.

BATTLESHIP
"Mikasa"



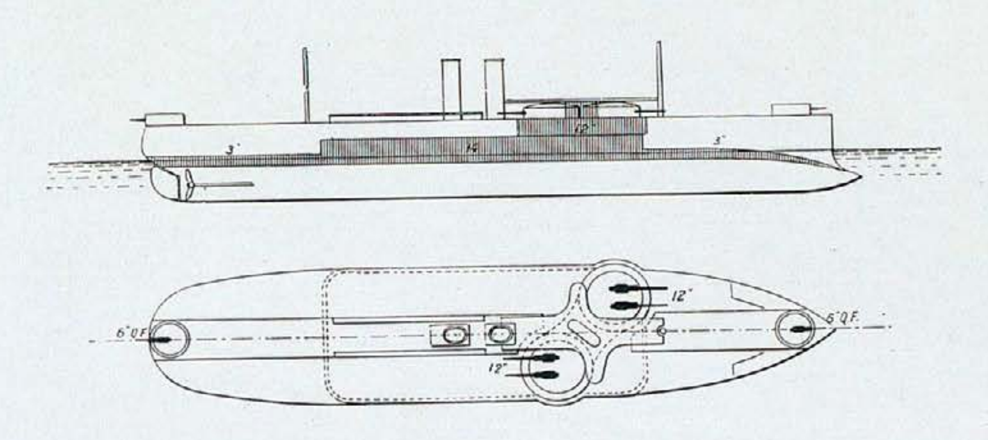


The "Asahi" & "Shikishima" Have but Two Funnels

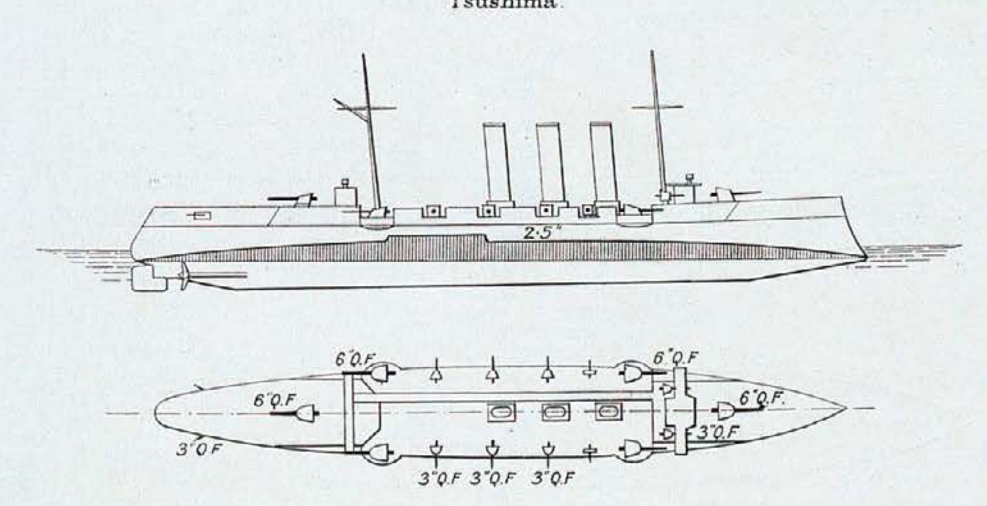
Plate 52.

JAPAN.

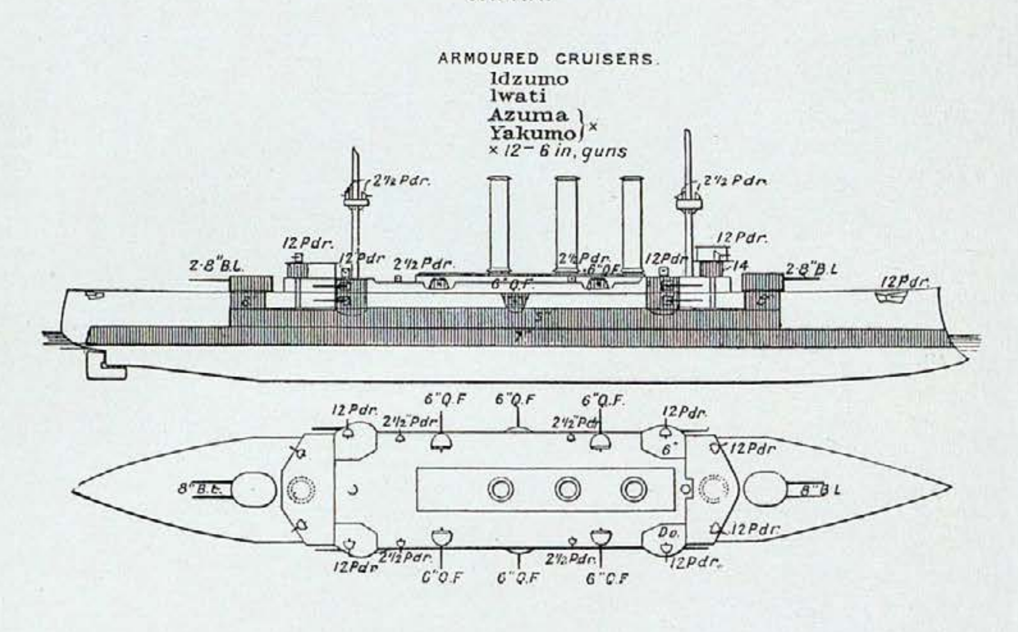
Chin Yuen.



Niitaka.
Tsushima.



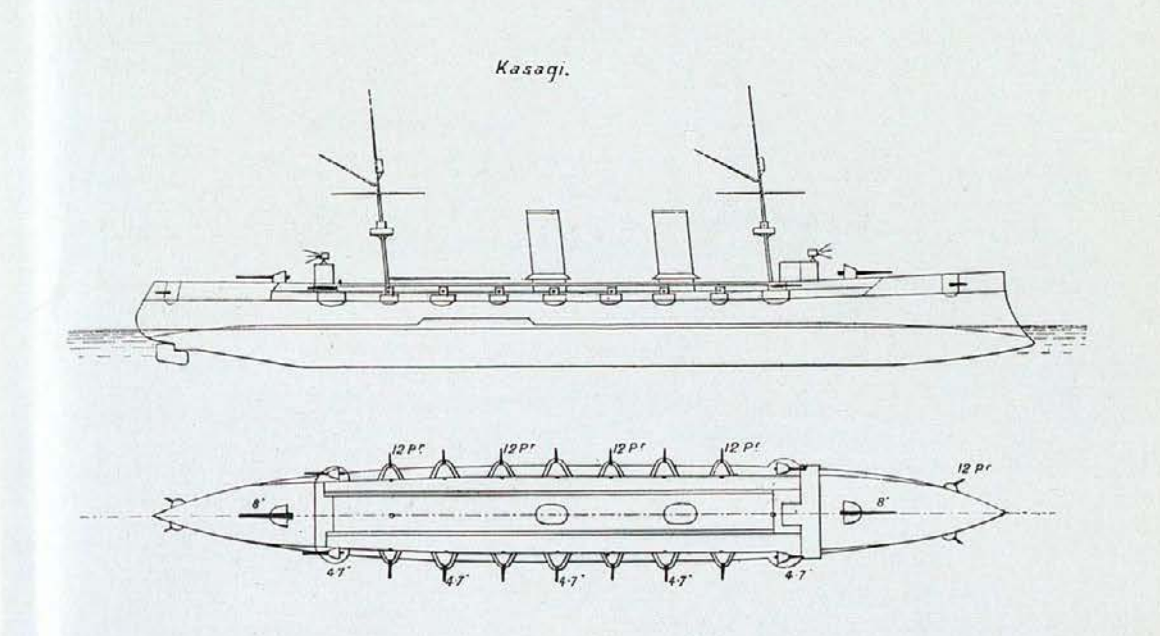
JAPAN.



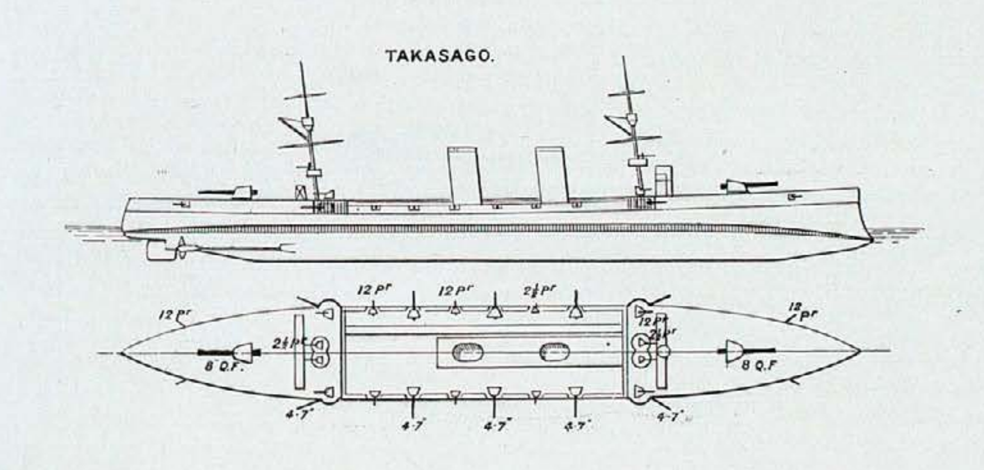
Asama and Tokiwa

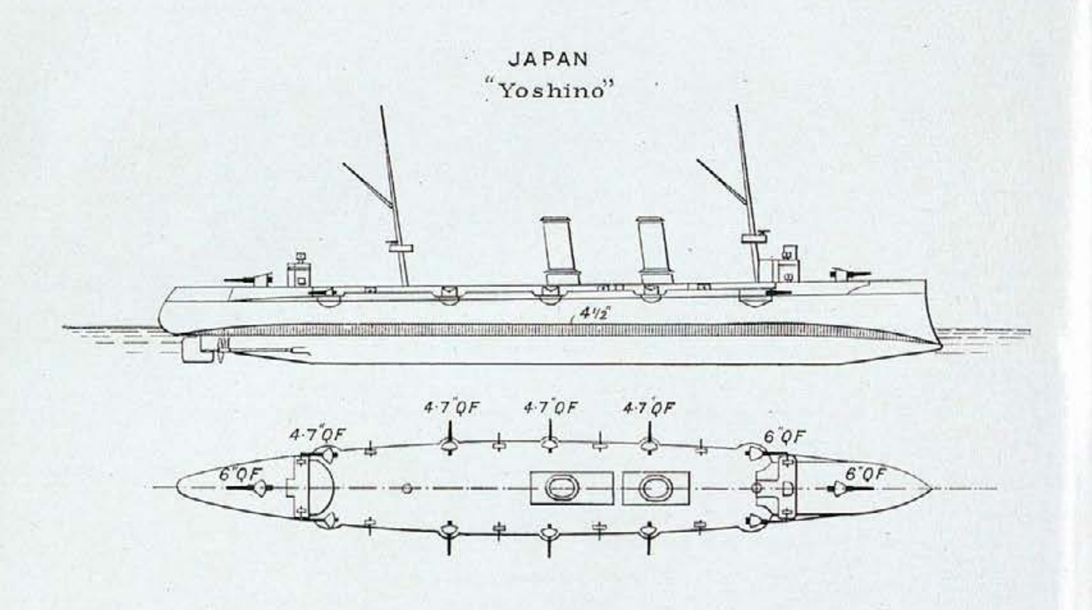
JAPAN.

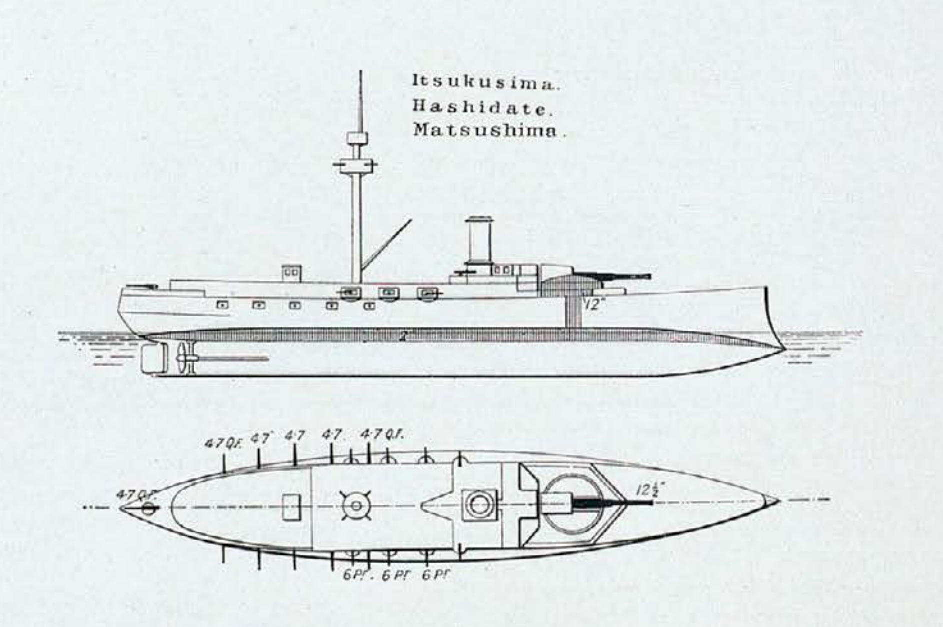
Kasagi.



TAKASAGO.

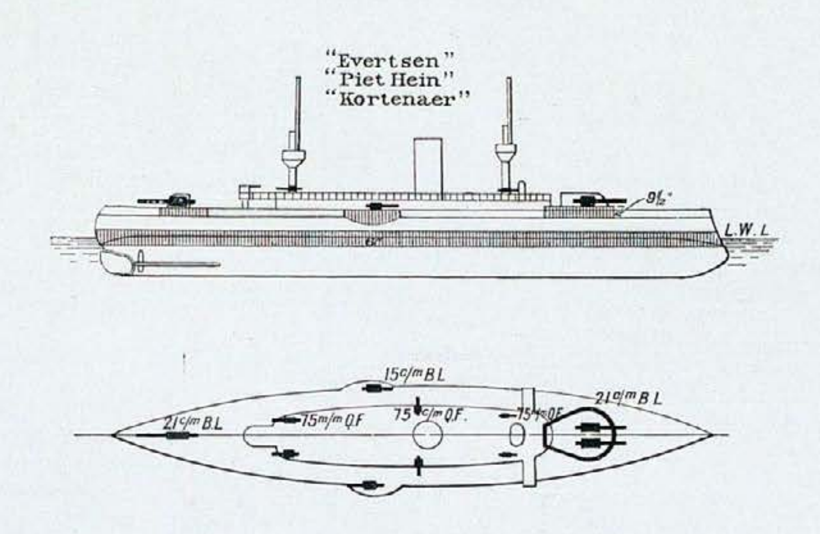



JAPAN
"Yoshino"
4½"
4·7"QF
4·7"QF
4·7"QF
4·7"QF
6"QF
6"QF
6"QF

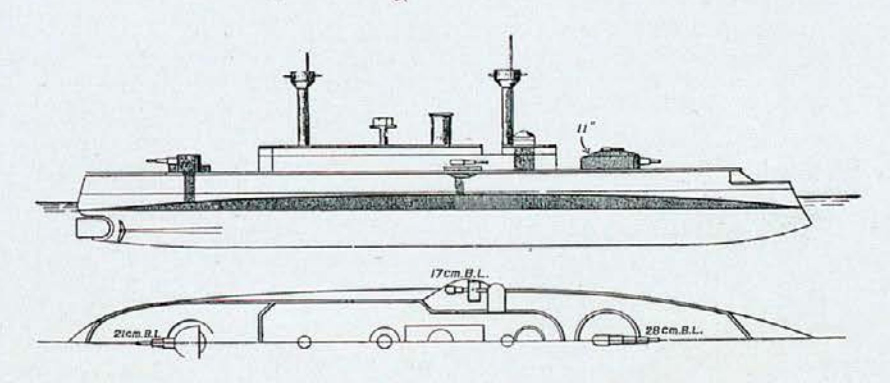

Itsukusima.
Hashidate.
Matsushima.
12"
12½"
6 Pr. 6 Pr 6 Pr

NETHERLANDS.

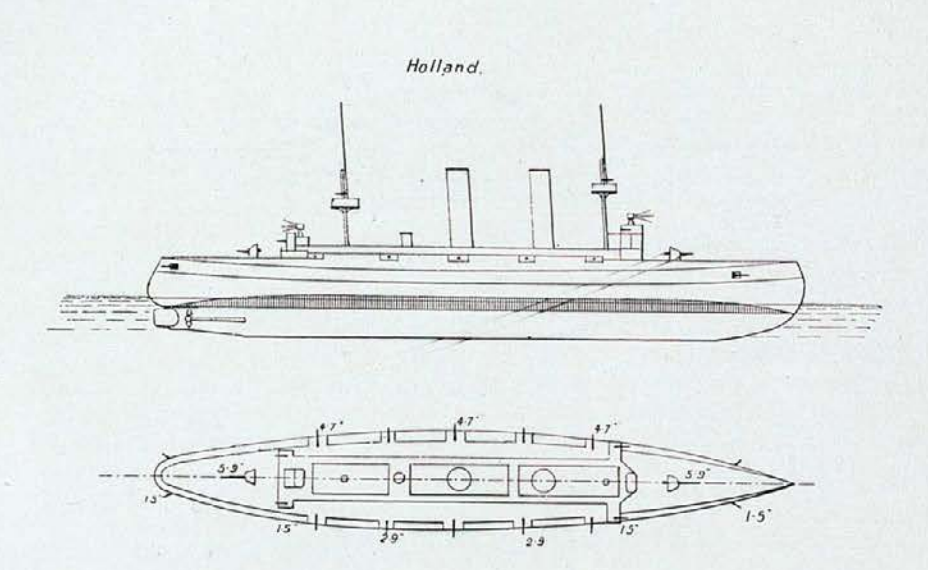
"Evertsen"
"Piet Hein"
"Kortenaer"



Koningin Wilhelmina der Nederlanden.



NETHERLANDS.



NORWAY.

ARMOUR-CLADS.

"Norge"
"Eidsvold"

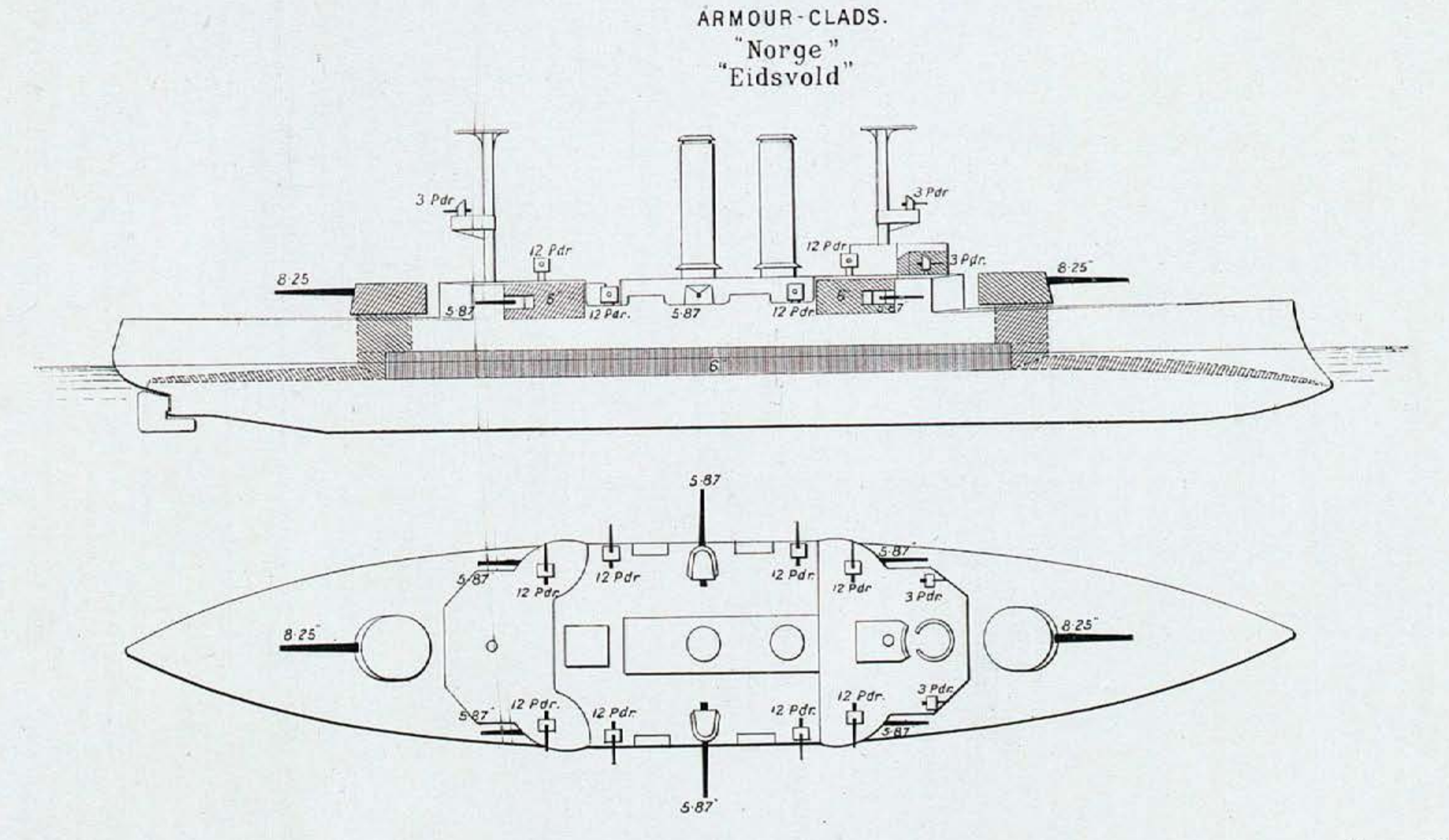
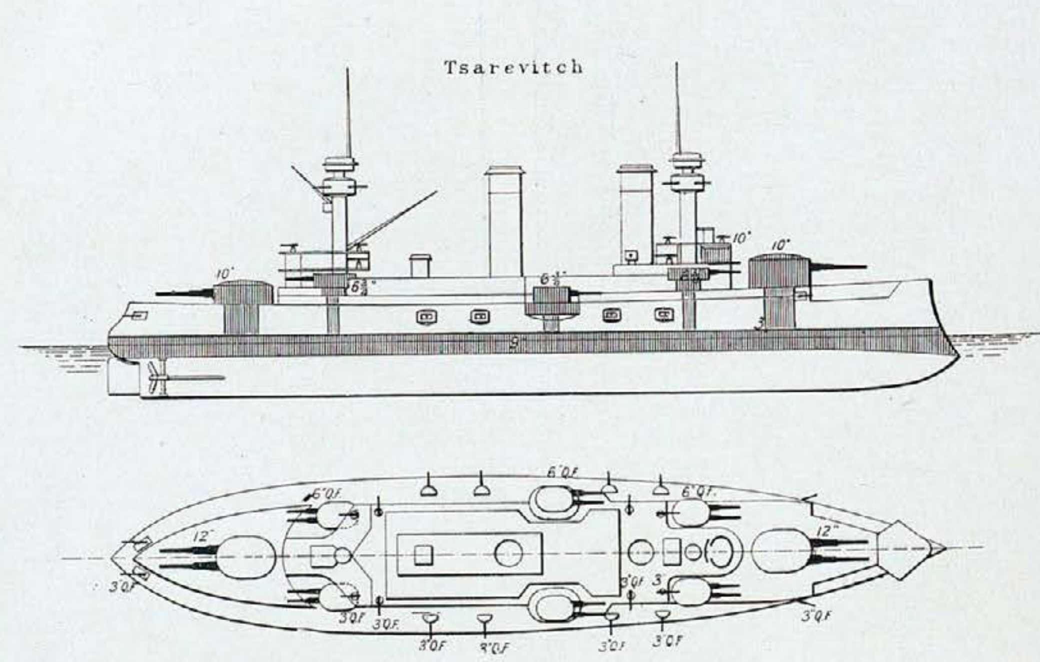


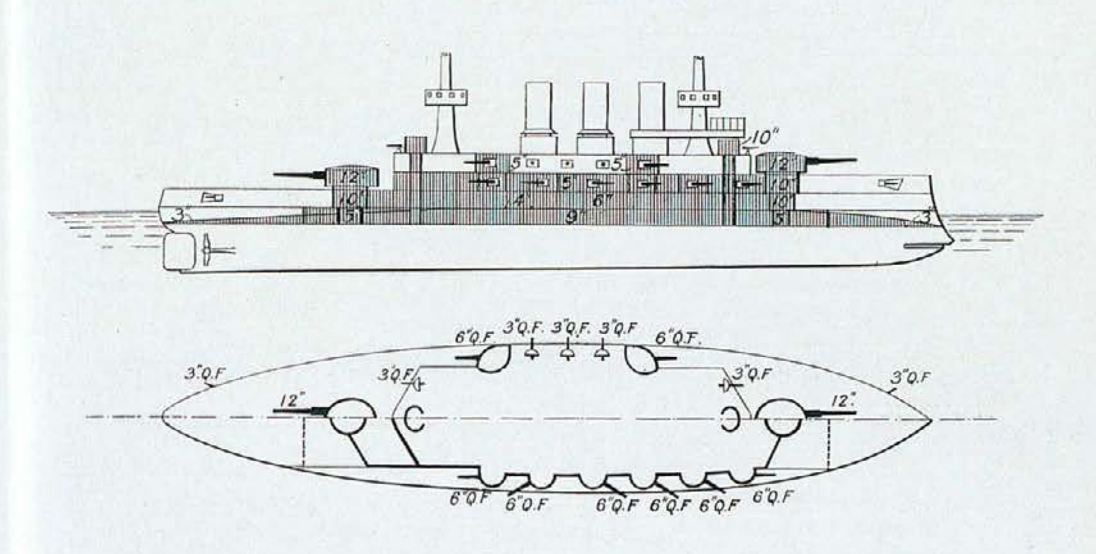
PLATE 59.

RUSSIA
"Borodino"
"Imp. Alexander III"
"Kniaz Souvaroff"
"Orel"
"Slava"

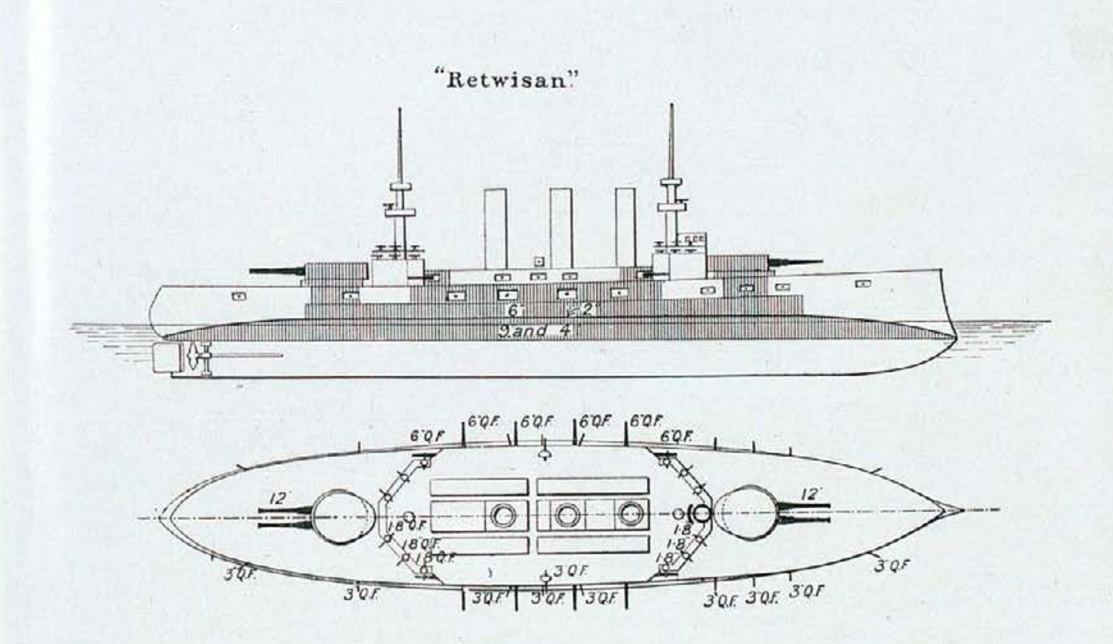


RUSSIA.

Kniaz Potemkin Tavritchesky



"Retwisan."

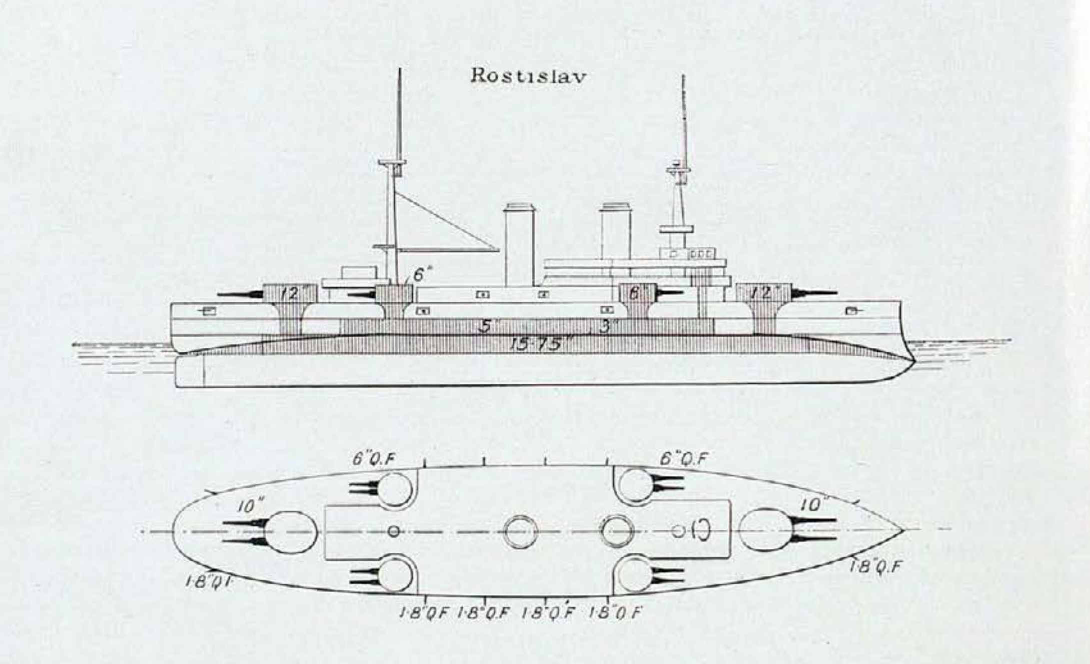


RUSSIA.

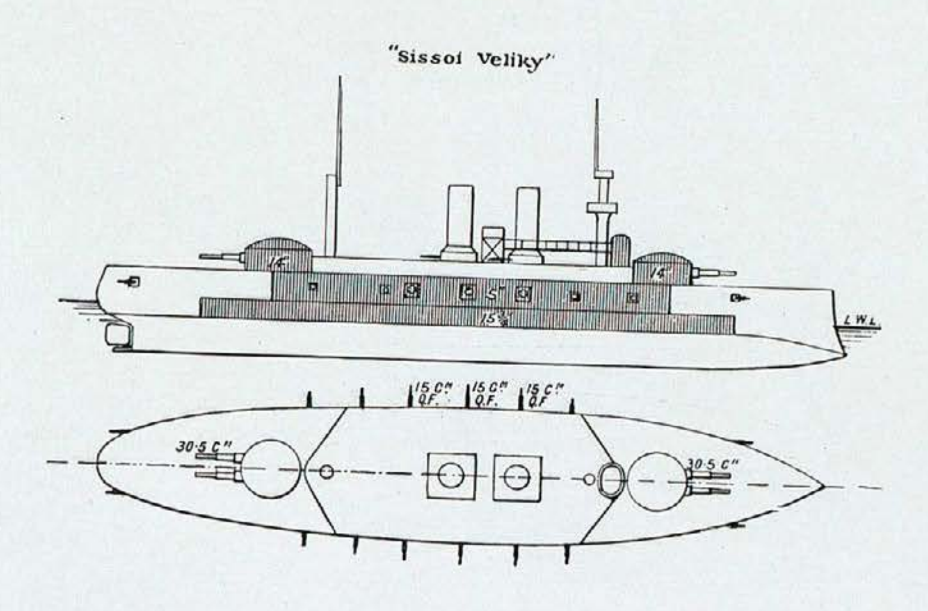
FIRST CLASS BATTLE-SHIPS

"Oslabya"
"Peresviet"
"Pobieda"

Note: In the "Pobieda" the Belt Extends the Full Length of the Ship.



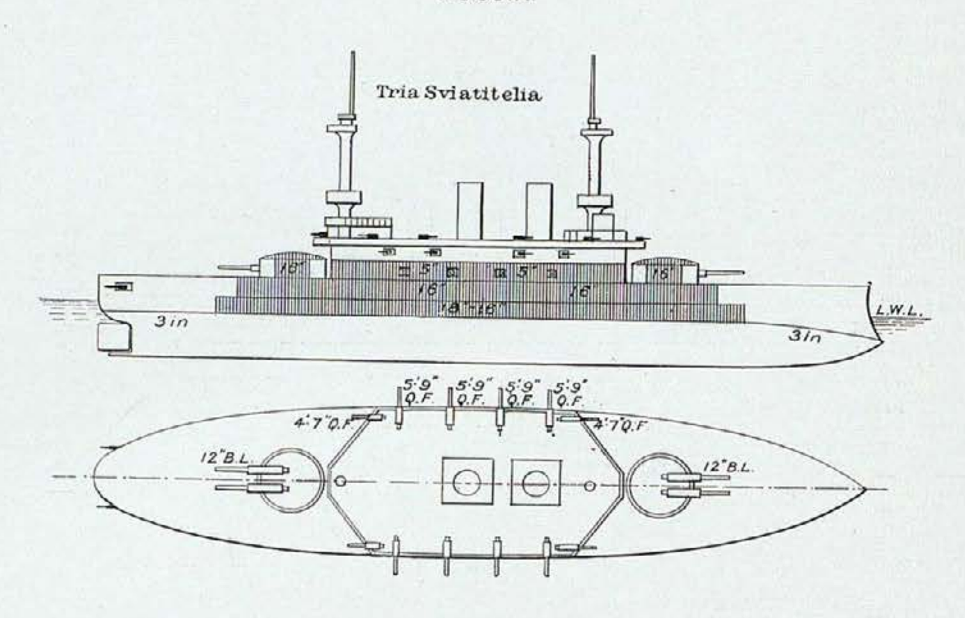
RUSSIA.



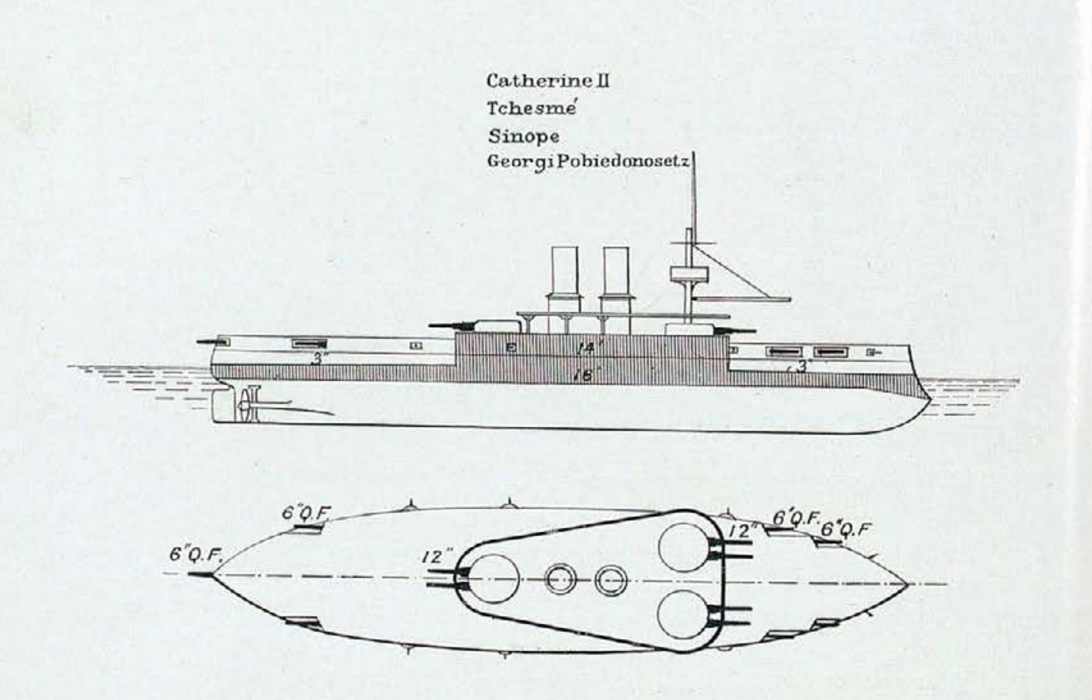
PETROPAVLOVSK
POLTAVA
SEVASTOPOL

10"
10"
5·9" Q.F.
5·9" Q.F.
5·9" Q.F.
5·9" Q.F.
12"
12"

RUSSIA.



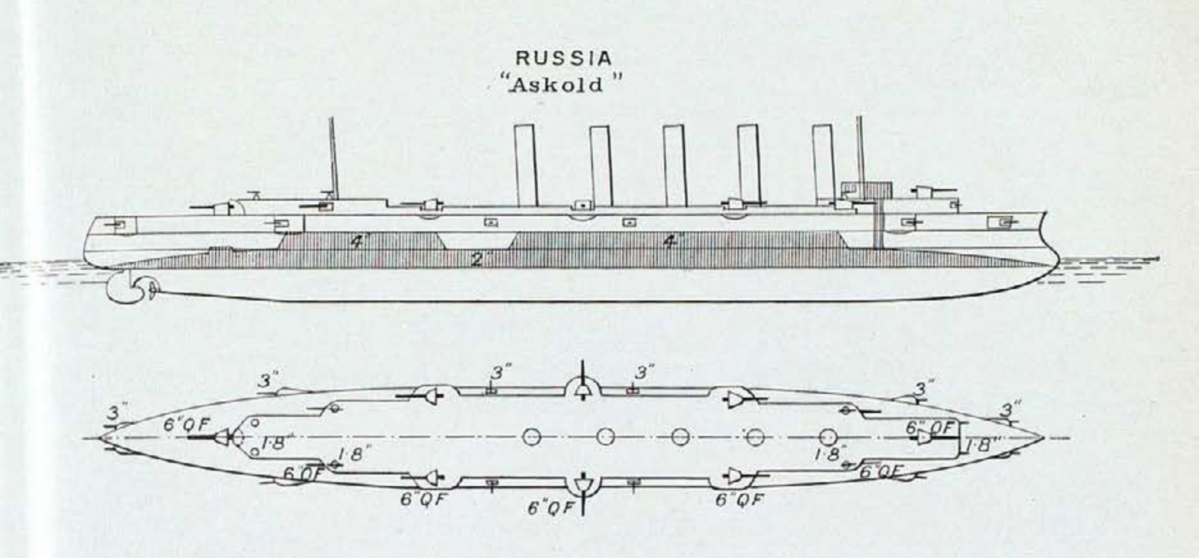
Tria Sviatitelia
16"
5"
16"
18"-16"
3 in
3 in
L.W.L.
5'9" Q.F.
5'9" Q.F.
5'9" Q.F.
5'9" Q.F.
4'7" Q.F.
4'7" Q.F.
12" B.L.
12" B.L.



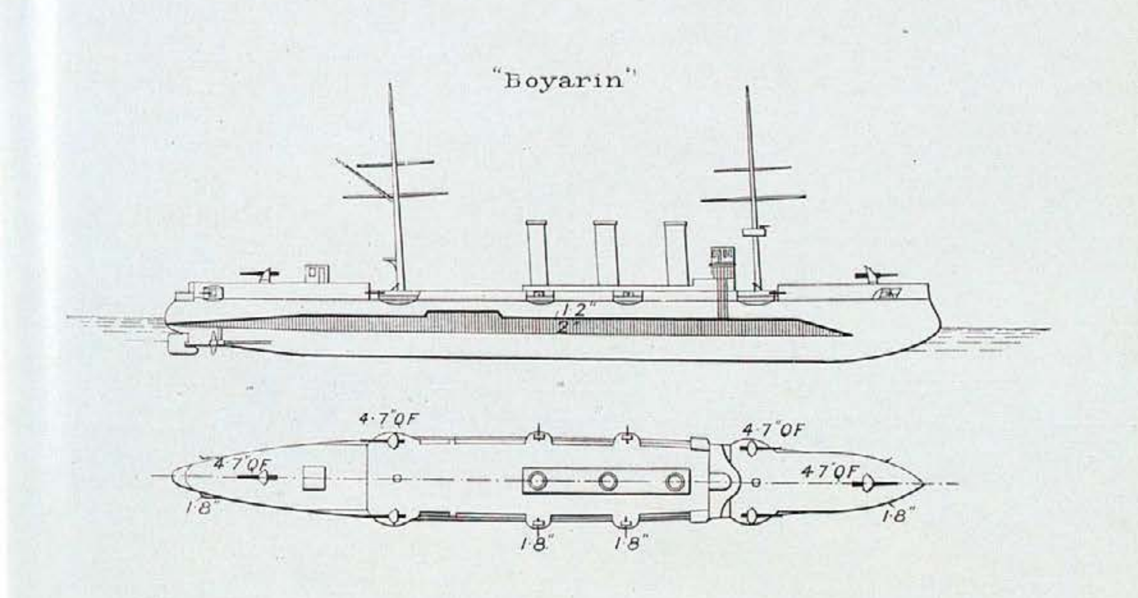
Catherine II
Tchesmé
Sinope
Georgi Pobiedonosetz
14"
16"
3"
3"
6" Q.F.
6" Q.F.
6" Q.F.
6" Q.F.
12"
12"

RUSSIA

"Askold"

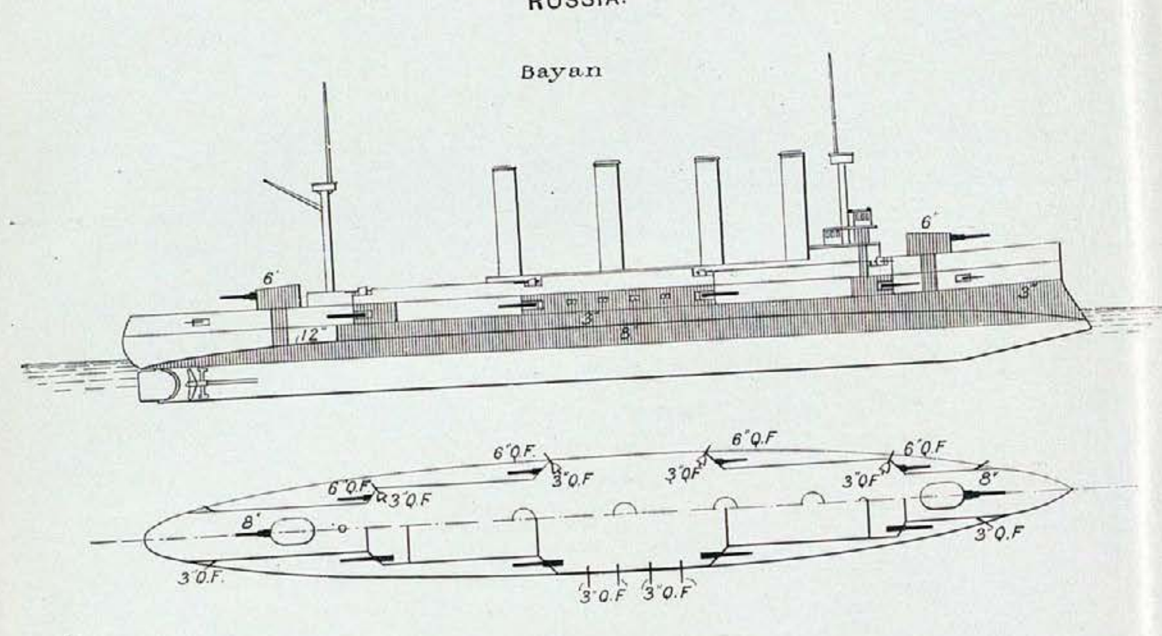


"Boyarin"



RUSSIA.

Bayan

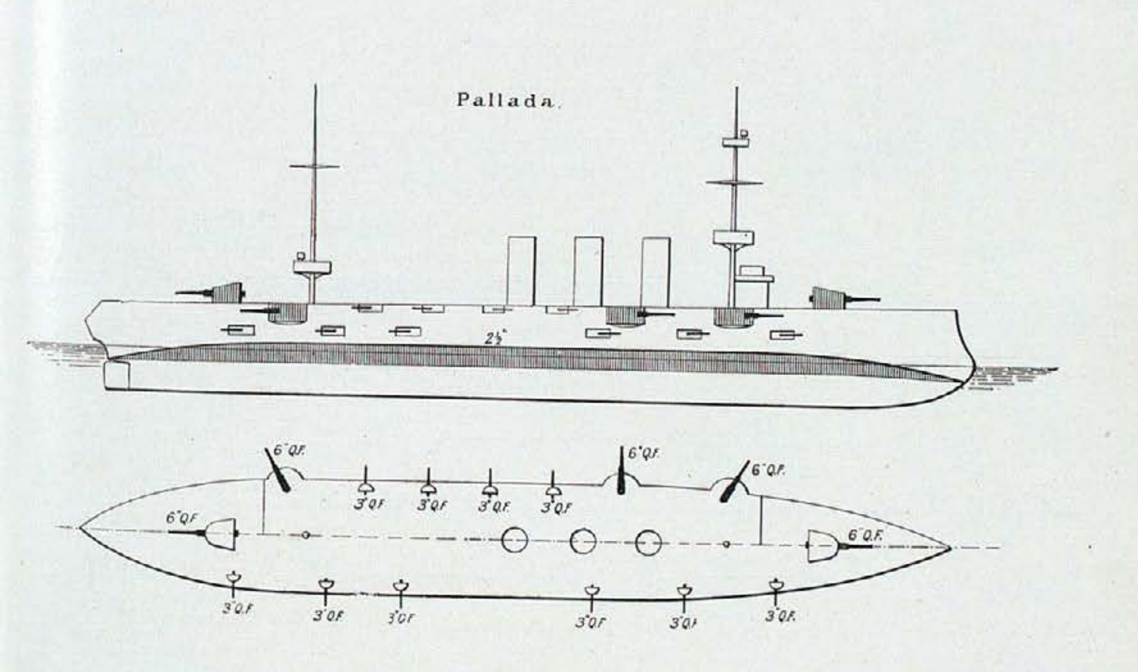


"Bogatyr" Class

RUSSIA.

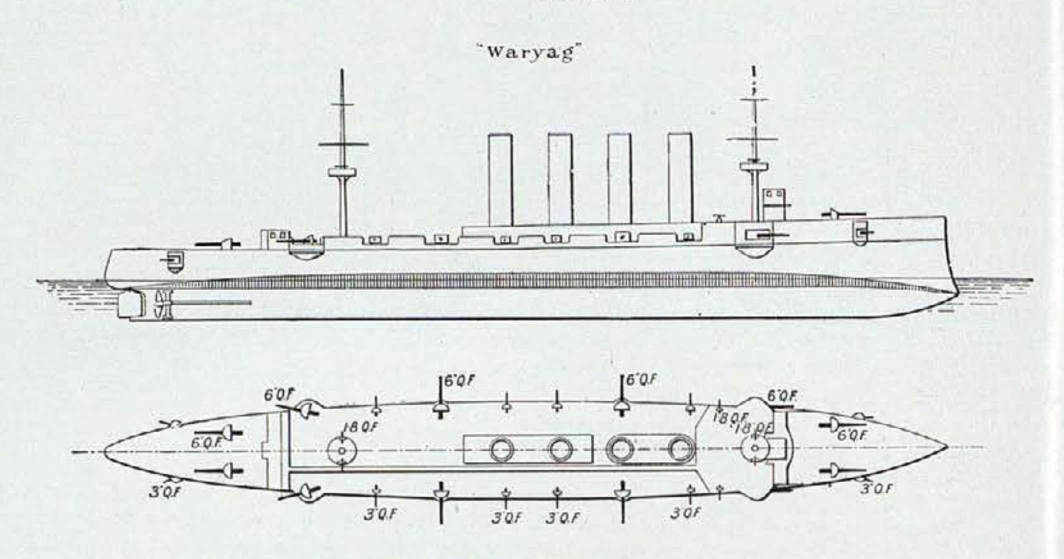
ARMOURED CRUISER "Gromoboi".

Pallada.



RUSSIA.

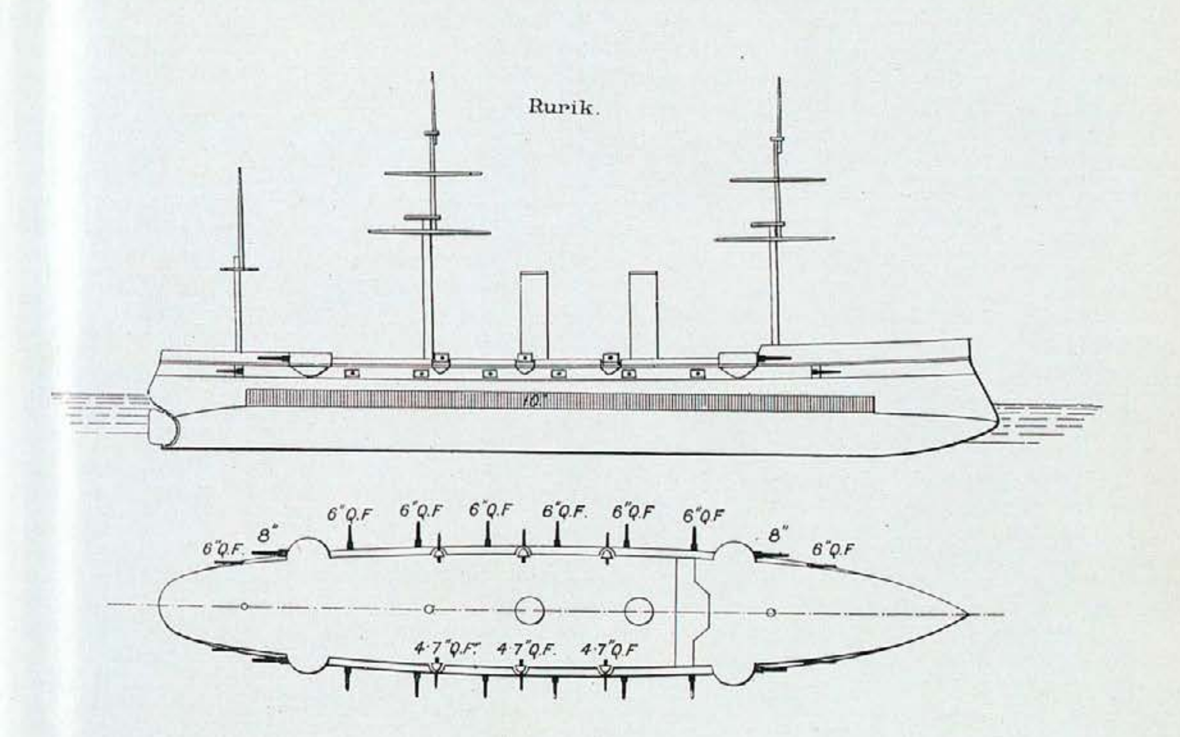
"Waryag"

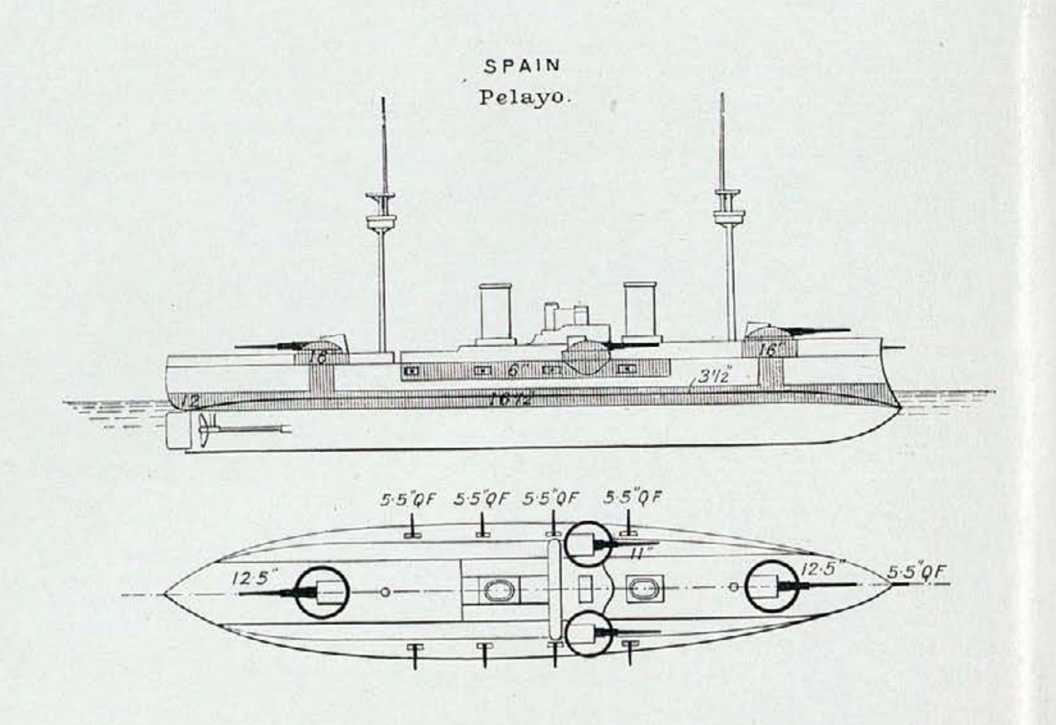


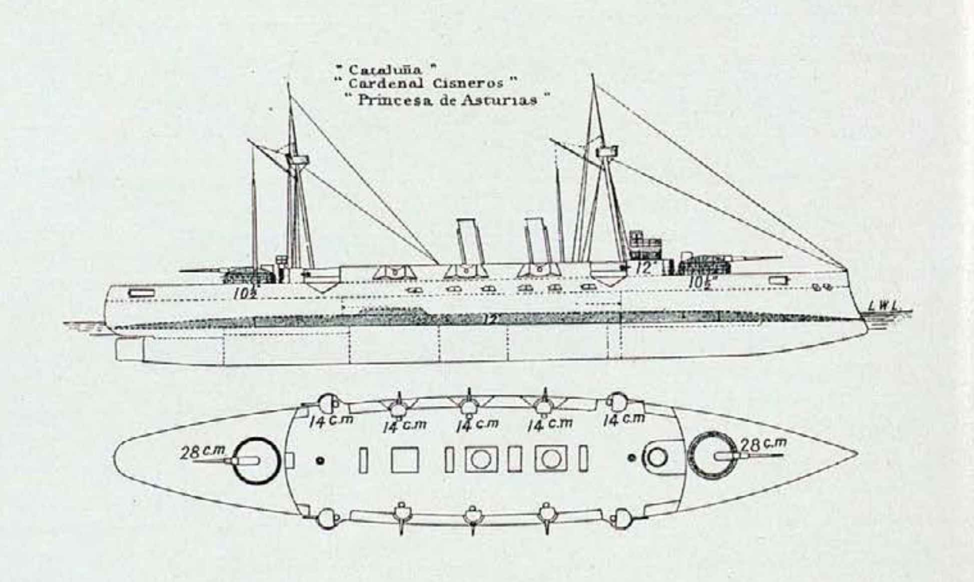
Rossia

9
9"
2¾
2¾"
6"Q.F
6"Q.F
6"Q.F
6"Q.F
6"Q.F
6"
6"Q.F
6"Q.F
1.8"
3"Q.F
8"
1.8"
1.8"
1.8"
1.8"
1.8"
3"Q.F
3"Q.F
3"Q.F
3"Q.F
8"
1.8"
1.8"
6"Q.F
3"Q.F
1.8"

RUSSIA.




SPAIN
Pelayo.
16"
6"
16"
3½"
12
16/12
5·5"QF
5·5"QF
5·5"QF
5·5"QF
12·5"
11"
12·5"
5·5"QF

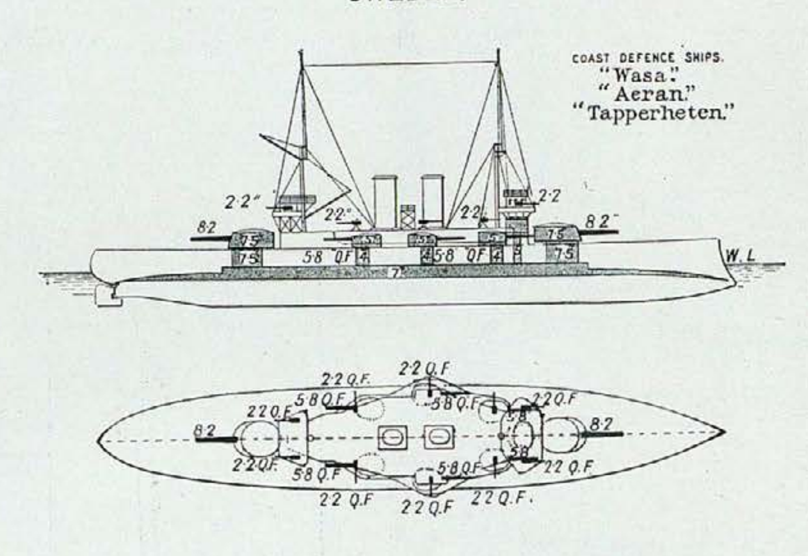

" Cataluña "
" Cardenal Cisneros "
" Princesa de Asturias "
10½
12"
10½"
12
L.W.L.
14 c.m
14 c.m
14 c.m
14 c.m
14 c.m
28 c.m
28 c.m

SPAIN.

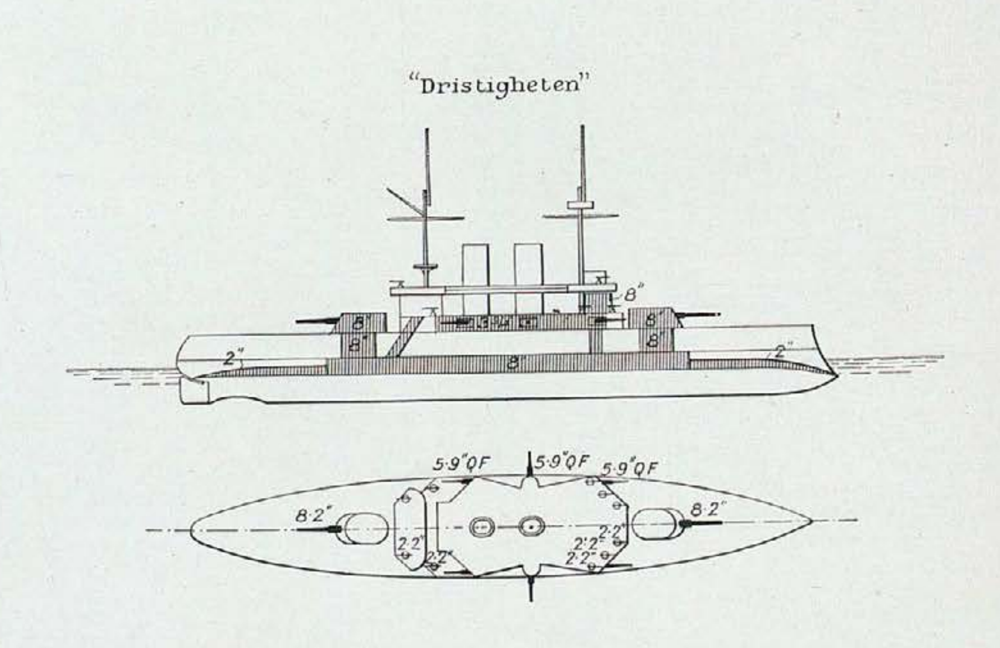
"Emperador Carlos V."

PLATE 71.

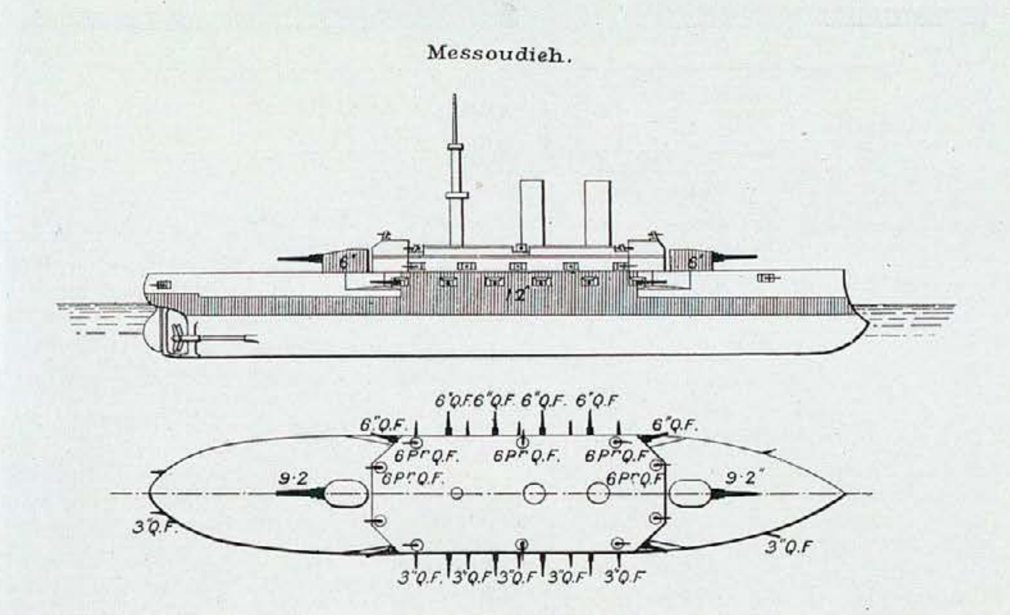
SWEDEN.



"Dristigheten"

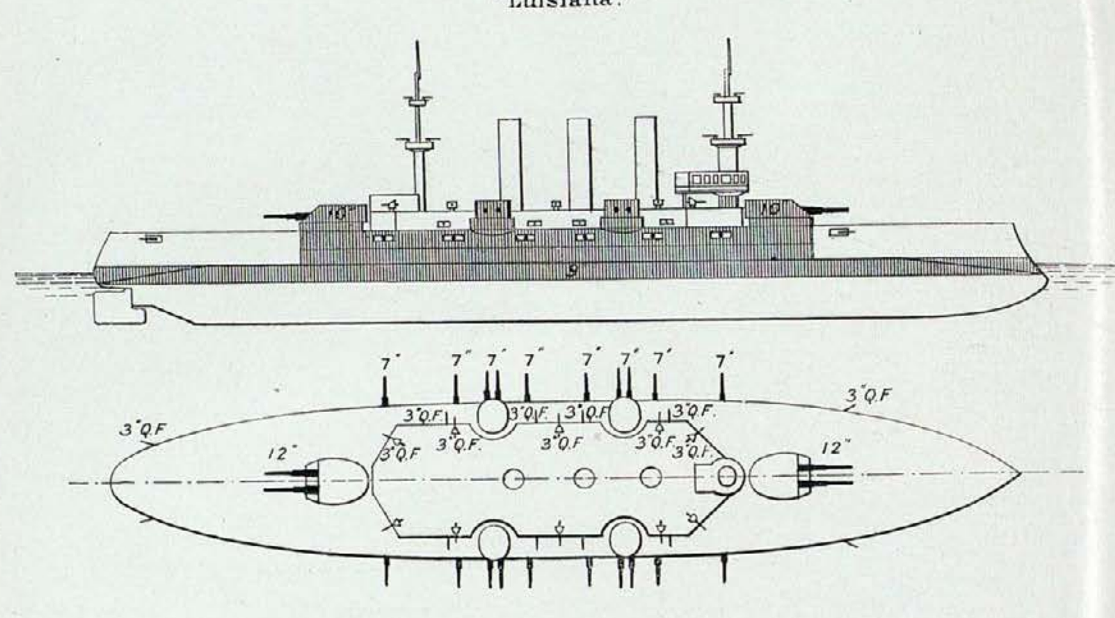


Messoudieh.


6"
6"
12"
6"Q.F. 6"Q.F. 6"Q.F. 6"Q.F
6"Q.F.
6"Q.F.
6PrQ.F.
6PrQ.F.
6PrQ.F
6PrQ.F.
6PrQ.F
9·2
9·2"
3"Q.F.
3"Q.F
3"Q.F. 3"Q.F 3"Q.F 3"Q.F 3"Q.F

UNITED STATES.

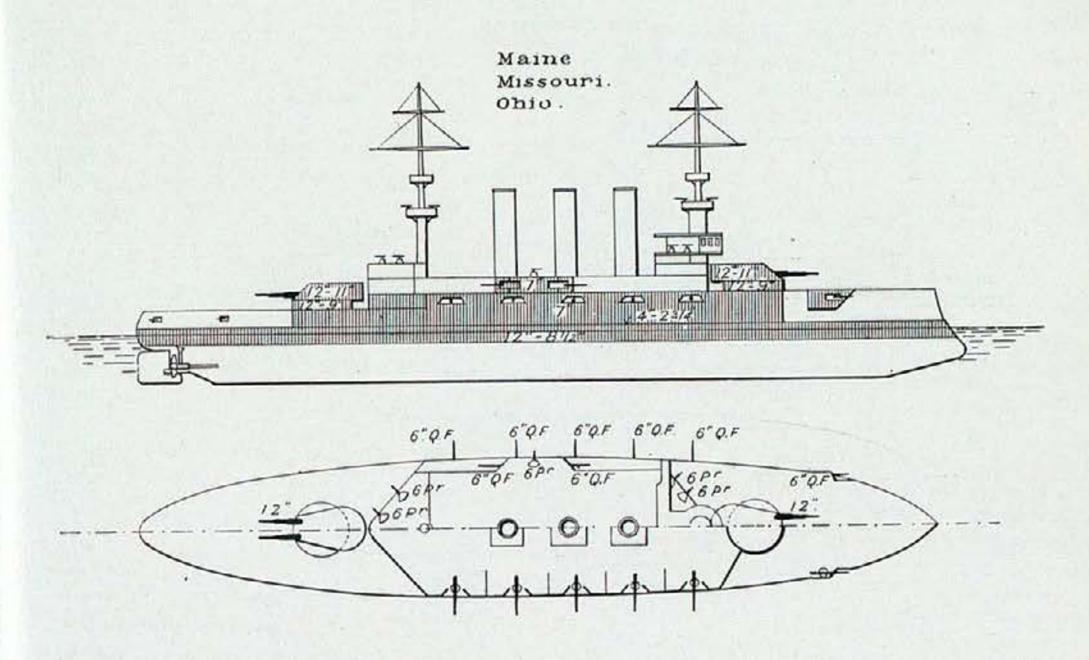
"Connecticut."
"Luisiana."

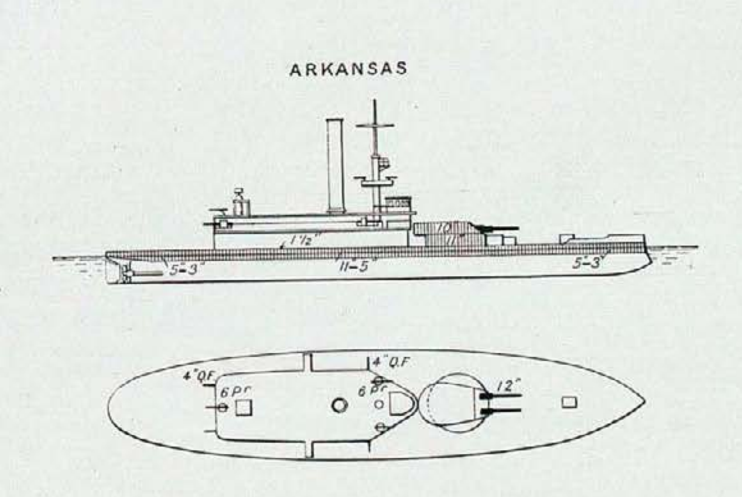


Georgia
Nebraska
New Jersey
Rhode Island
Virginia

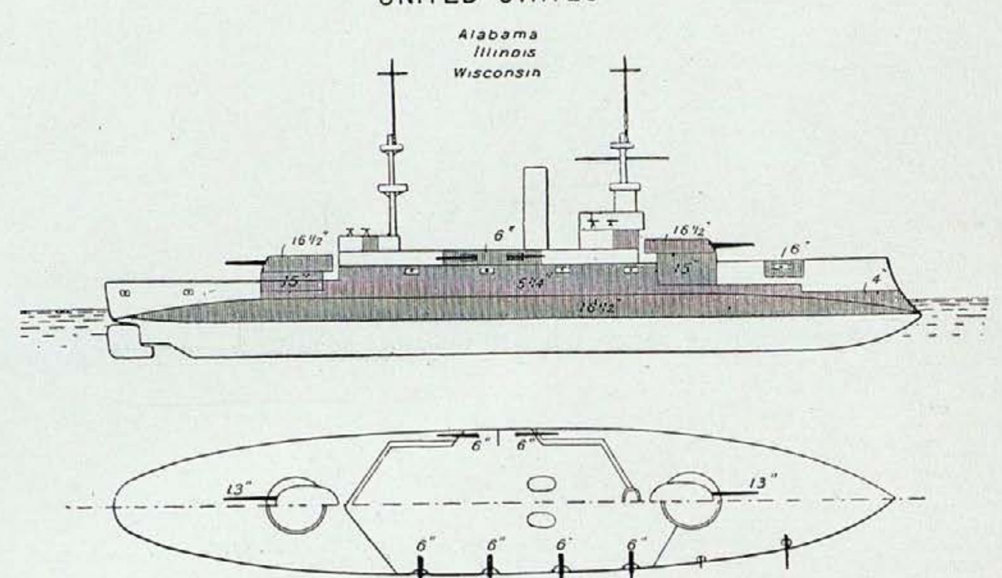
8" B.L
12" B.L
6" Q.F
3" Q.F
3 Pr

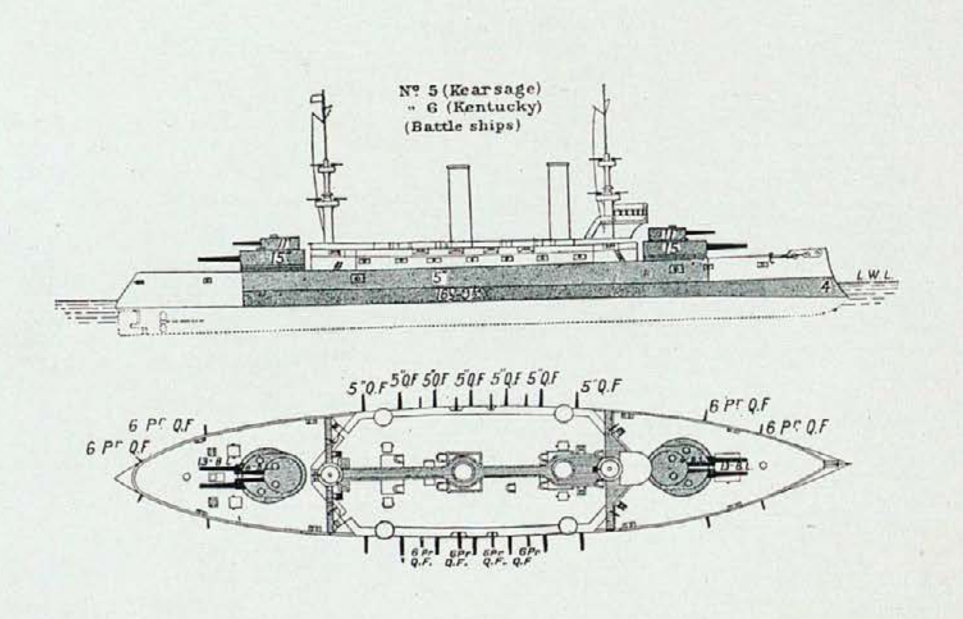
UNITED STATES.





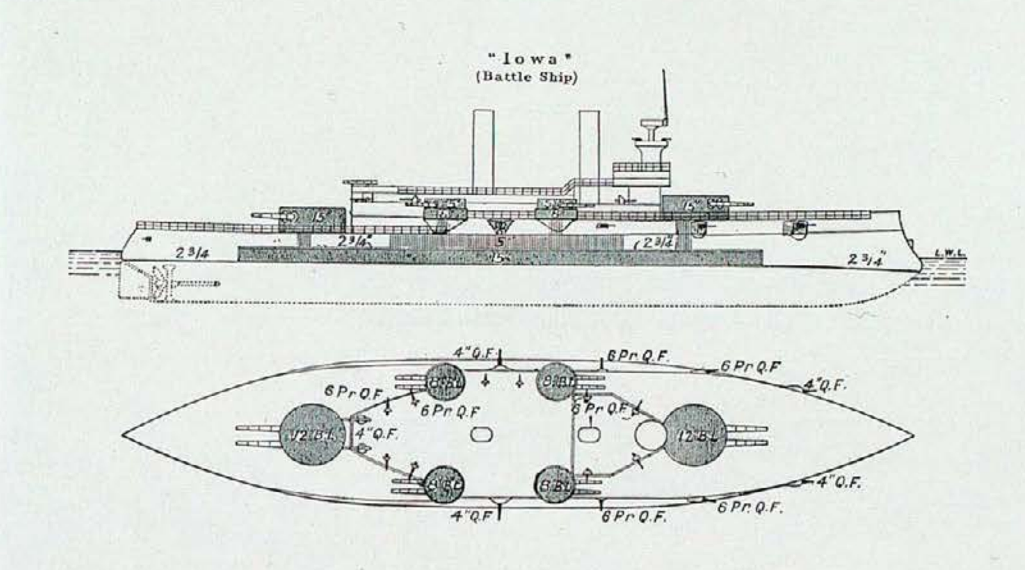
UNITED STATES





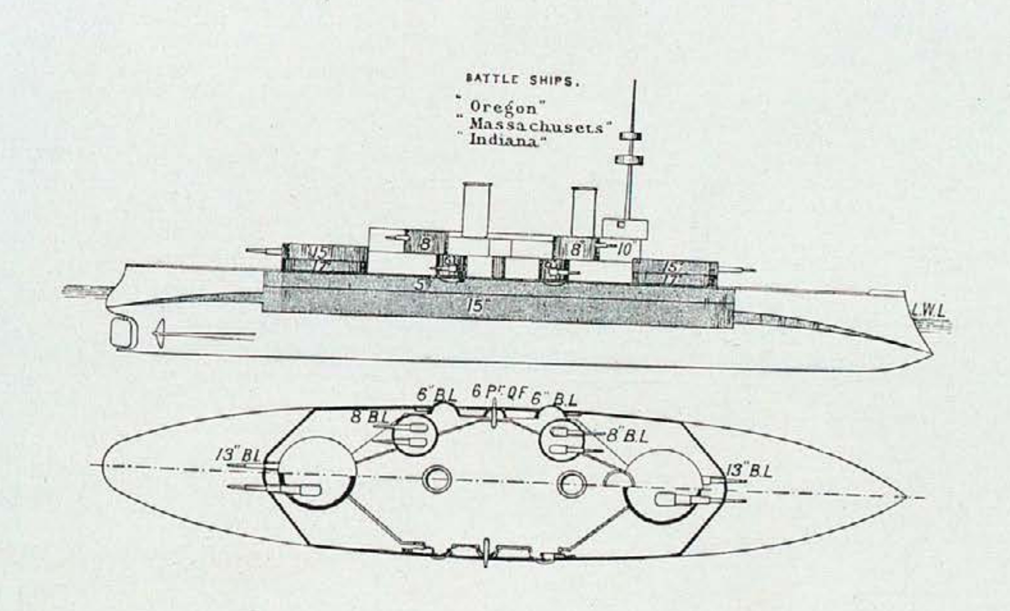
UNITED STATES.

"Iowa"
(Battle Ship)



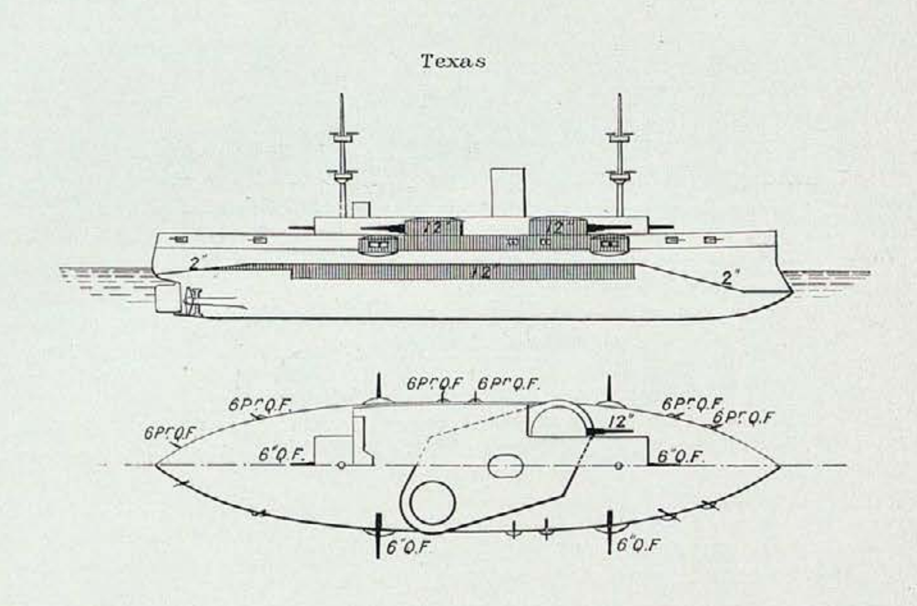
BATTLE SHIPS.

"Oregon"
"Massachusets"
"Indiana"

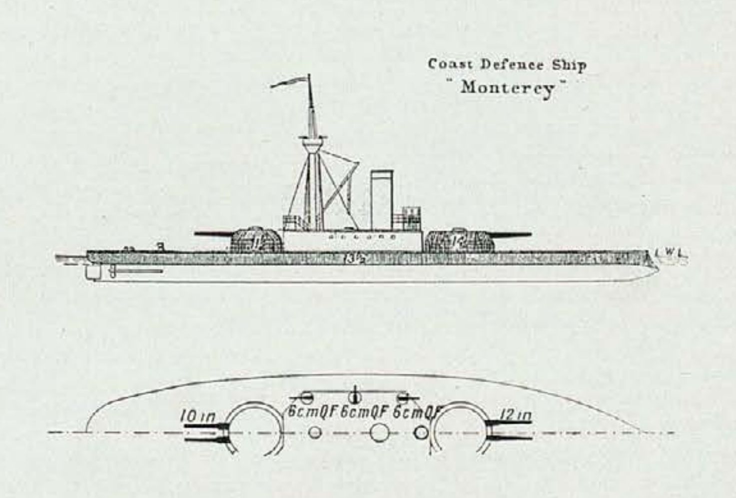


UNITED STATES.

Texas

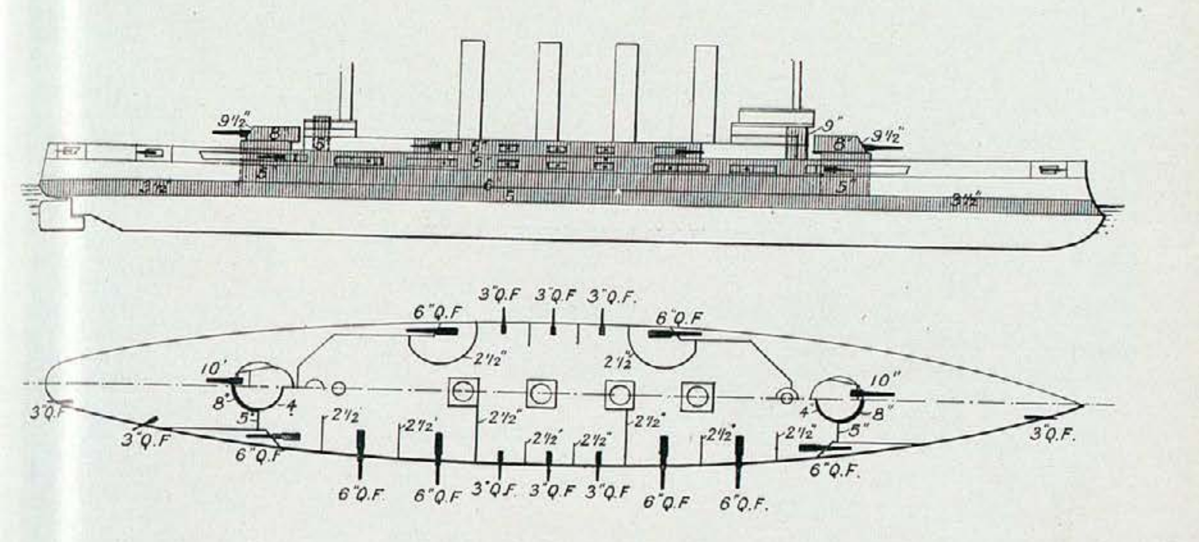


Coast Defence Ship "Monterey"



UNITED STATES.

Washington.
Tenessee.

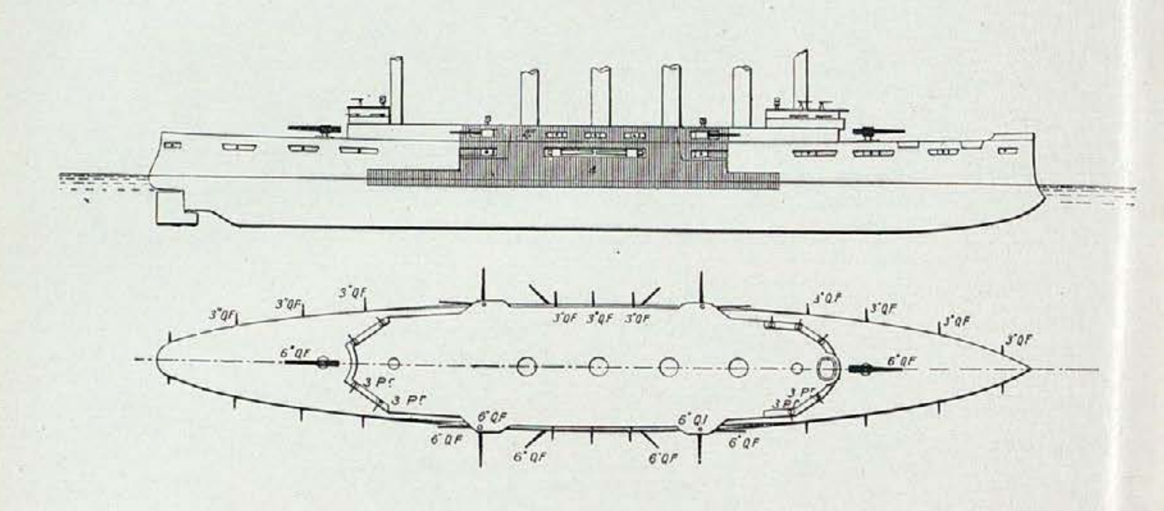


California.
Pennsylvania.
West Virginia
Colorado
Maryland
South Dakota

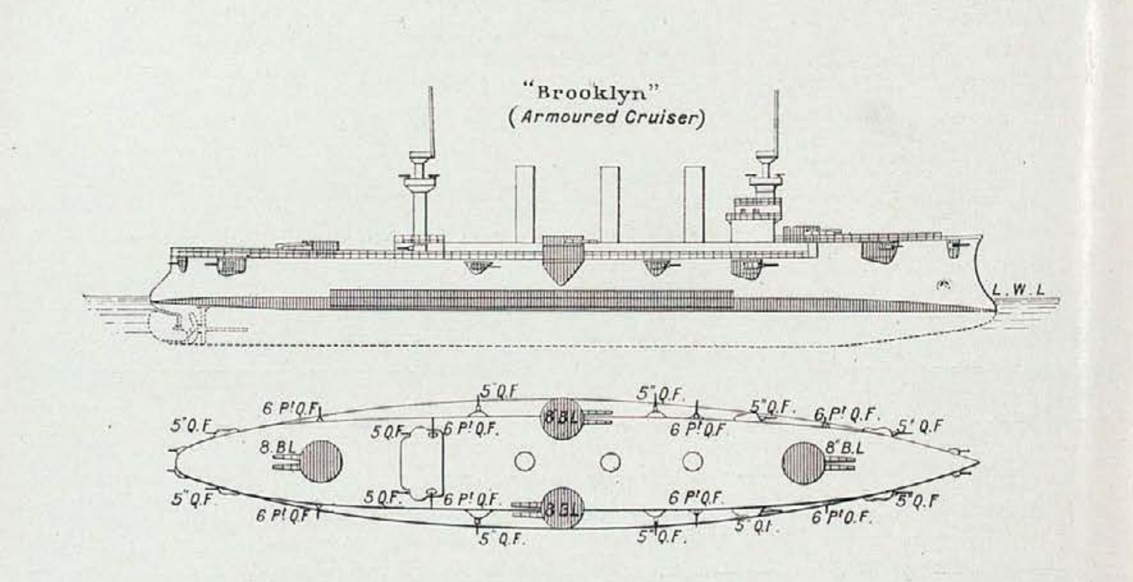
6"
7½"
6" at top
5" at bottom
3½"
6"QF
3"QF
8"BL
3P.r

UNITED STATES.

Charleston.
Milwaukee.
St. Louis.

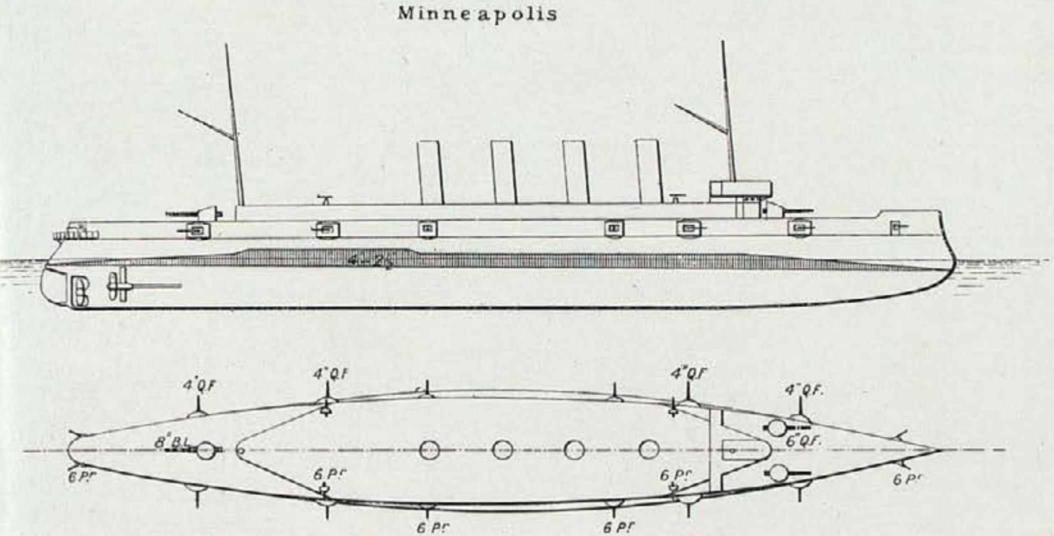


"Brooklyn"
(*Armoured Cruiser*)

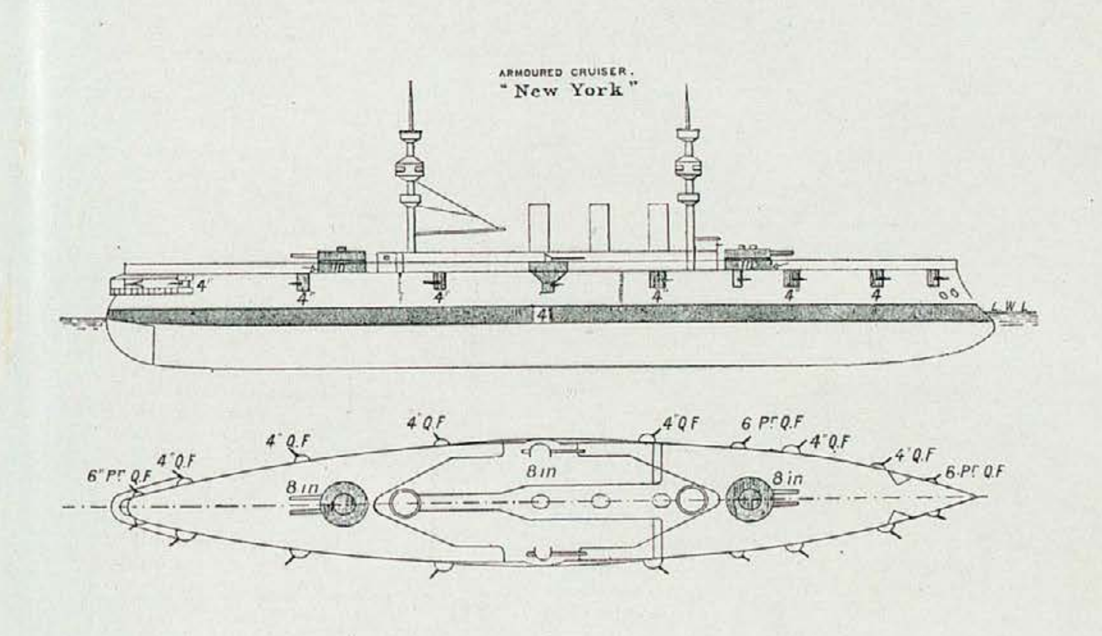


UNITED STATES.

Columbia.
Minneapolis



Note:- *Minneapolis has only two funnels.*

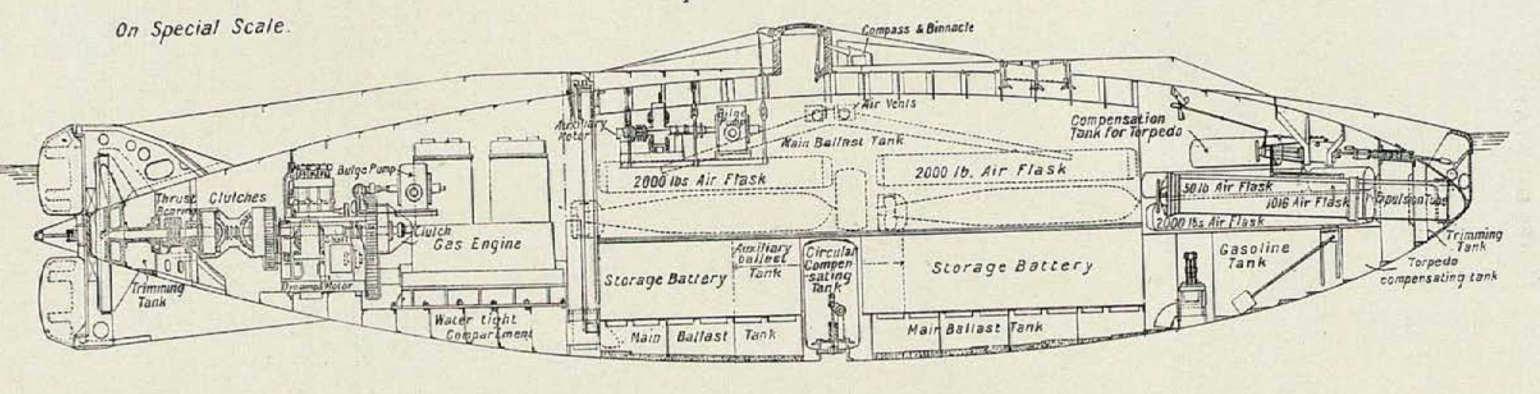


UNITED STATES.

SUBMARINE TORPEDO BOAT.

Adder. Moccasin. Porpoise.
Grampus. Pike. Shark.

On Special Scale.



PART III.

ARMOUR AND ORDNANCE.

PART III.

CHAPTER I.

Armour.

We mentioned last year that one hundred armoured vessels were then building in the yards of no more than five nations, and that this number had never before been reached. Nor is it likely to be attained again. The ships completed in 1902 were much more numerous than those laid down. The task of rapidly building, armouring, and equipping one hundred ships at one time has proved too much for even the five great naval Powers. It was found that the ships were too many to complete rapidly, and that the rate of building was going back. So the energies of the various yards, armour and ordnance factories, are now being devoted rather to finishing those ships already begun than to beginning new ones. In the earlier stages of a ship's progress there is no call upon the armour maker. So that, though there are fewer ships building this year than last, there is still an immense deal to do in providing armour for the ships still incomplete. Moreover, as the years go on, the weight of armour fitted to each class of ships tends to increase with leaps and bounds. The weight of armour now applied to a first-class armoured cruiser is greater than that carried by a battleship ten years ago; and the weight of the battleship's armour has increased 40 per cent in the same time.

Armoured ships building.

More armour means more displacement, and in every country of the world the battleships laid down in 1902 were of greater displacement than their predecessors of the same type.

Increase of displacement allows more armour to be carried.

Country.	Displacement of Recent Ships.			
	Laid down 1902–3.		Largest Ship laid down previously.	
	Battleship.	Cruiser.	Battleship.	Cruiser.
Great Britain . . .	16,350	13,550	15,000	14,100
France	14,630	13,560	12,527	11,092
Russia	16,000(?)	6,675	12,912	12,359
Germany	13,000	9,348	11,640	10,482
United States . . .	16,000	14,500	14,948	13,680
Italy	12,425		15,649	7,234

The increase of the displacement of the armoured cruisers is not so marked. Russia, after building three of 12,000 tons, held her hand, and laid down nothing larger than a protected cruiser of 6675 tons in 1902. Great Britain has gone back a few tons, but still approaches 14,000. France is building larger ships than ever before, and greatly prides herself on her vessels of 12,500 tons, which are increased to 13,560 in the latest design. Germany has decreased, and has nothing larger than 9500. The habitat of the big cruiser *par excellence* is now across the Atlantic, where the United States has on the stocks eight cruisers of 13,700 to 14,500 tons and 22 knots speed, which will form a squadron that no other Power save Great Britain can match. Italy is building five hybrids or intermediates, which may be called fast, lightly-armed battleships, or slow armoured cruisers, but no one else is following her lead at present.

Principle on which armour is applied.

The general principle underlying the application of armour seems to be that the battleship should have the engines, boilers, and midships water-line safeguarded from the heavy guns of an enemy's battleship, whilst the secondary armament should equally be safe from the Q.F. guns. This ideal has not been attained in existing ships, for both the engines and heavy guns are open to attack from armour-piercing projectiles at ranges of 4000 yards or more. The secondary armament fares better. It is fairly safe when attacked by present-day Q.F. guns, but will not be safe against those now being made.

For the cruisers it is hard to say what is aimed at. There are something like twenty, including ten of the County class in England, three of the Kleber class in France, three of the Prinz Adalbert class in Germany, and three of the Milwaukee class in the United States, which have only 4-in. armour, easily penetrable by medium Q.F. guns, such as the 5·5-in. There are others, like the Bayan and the Tennessee, where the thickest armour is as much as 8 in., and impenetrable to the 7-in. gun.

Suggestions as to the best disposition of armour.

As there has been absolutely no improvement in the quality of armour in the last three years, and there are no signs of any further advance, it is as well to go carefully into the question of the adequacy of the protection at present applied, with the view of suggesting possible improvements in its disposition.

For battleships.

It cannot be said that the thick armour of battleships is satisfactory. We showed last year that a 12-in. Krupp cemented plate was penetrable by the 12-in. gun, then mounted, at 4000 yards range, whilst with the higher velocity that seemed probable the range of penetration would be increased to 6000 yards. Although there are whispers that the propellants giving the higher velocity are not so tractable as was hoped, and may not do all that has been claimed for

them, yet it is unlikely that the velocity will stand still; so that we must assume that the ships now building are liable to have their thick armour pierced almost immediately they get fairly into action. None of the battleships laid down in 1902 is to have armour thicker than 12 in., and many will have to be content with less than this.

					On Guns.	Water-line.
Thickest	British	armour,	King Edward	Class	12 in.	9+2 =12
,,	American	,,	Connecticut	,,	12 ,,	10+3 =14
,,	French	,,	République	,,	11 ,,	11+2¾=15
,,	Russian	,,	Borodino	,,	11 ,,	10+1½=12
,,	German	,,	Braunschweig	,,	10 ,,	9+2½=12½

Note.—The total resistance of belt and sloping deck are allowed for in last column.

The nation that first reverts to the thickness of 15 in. to 16 in., both on guns and water-line, that was common seven years ago will get a distinct advantage.

Water-line protection.

It is not intended to advocate the return to the massive plates that covered the water-line of the Bouvet or Iowa, in which all the protection was given by a single plate of the thickness required. The system adopted in the Majestic, by which the water-line protection consists first of a vertical plate forming the external belt, and, secondly, of a sloping plate laid on the armoured deck, seems decidedly preferable. The plates in the Majestic are 9-in. Harvey and 4-in. ordinary steel respectively; this would scarcely be sufficient even if Krupp steel was substituted. In the République class, the belt covering the midship part of the ship is from 11 in. to 9½ in. with a 2¾-in. deck: this should be nearly adequate; whilst the Georgia class in the United States have an 11-in. belt and 3-in. sloping deck. If the British plan of a plate of uniform thickness be preferred for the belt, we should put the outer plate at 10 in. and the deck at 4 in. The former would be completely proof against all 8-in. and most 9·2-in. shot, whilst the latter would keep 12-in. shot out of engines, boilers and magazines, which are not sufficiently protected by the King Edward's 9-in. belt and 2-in. deck.

Tapering belt.

An alternative to the belt of uniform thickness, as in the Majestic, is the belt, which is tapered from the centre, both upwards and downwards, and which is practically universal abroad. The principle of the latter is that the thickest armour is placed where it is most important. The lower part of the belt is protected by the water, and may therefore be reduced in thickness; the upper part may be reduced because it is so far above water that under ordinary conditions holes made in it can be readily plugged. Moreover, there is nothing of any fighting value behind that part of the belt. We therefore consider the belt of graduated thickness decidedly superior to one that is equally thick all over.

Breadth of the belt.

The breadth of the belt is also a question which is worth consideration. A sort of standard breadth for British ships is 15 ft. This allows of a roll of some 10 degrees before the bottom of the belt comes out of the water, and of 14 degrees before the top is immersed. The steadiness of the ships of the Majestic and later classes is most remarkable. We believe we are justified in stating that in ordinary Mediterranean weather weeks will elapse before a roll of 5 degrees is registered, whilst 10 degrees is phenomenal, and may not occur for months. Nothing can be more unreasonable than the reduction of the thickness of the belt to such a dangerous degree that armour-piercing shot will find their way into engine and boiler rooms, and all this to enable the ship to fight in very heavy weather, which may not occur once in a three months' cruise. It is far preferable to have a narrower belt, which can be trusted for protection. The breadth of the belt in the French battleships is 12½ ft. An 11-in. belt of this breadth would weigh no more than a 9-in. belt of the British type 15 ft. broad. There is not a shadow of a doubt that on nineteen days out of twenty the thick narrower belt would give greater security.

Armoured decks high above water.

In some fairly recent designs weight has been freely lavished on armoured decks from 8 ft. to 12 ft. above water, whilst the belt armour has been most dangerously reduced in thickness. The deck at the very top of the belt originally came from France, and we have followed suit. The Duncan, with her 7-in. belt and sloping lower deck only 1 in. thick, could be pierced with ease near the water-line through belt, deck, and coal by the 12-in. gun with existing velocity at 6000 yds., or by the 9·2 with velocity 2600 f.s. at 3000 yds. Yet this ship has a 2-in. main deck, which weighs as much as an extra 5 ins. of belt over all the vitals. Such a belt would have afforded almost perfect security to engines, boilers, and water-line, now so dangerously exposed. And it is by no means easy to see what the main deck is expected to safeguard. It would certainly prevent pieces of shell which burst between the casemates from going down into the flats above the lower armour deck, but as there should be no one in the flats in action this is immaterial. With the armoured main deck, shells bursting between the casemates will blow up the upper deck and wreck the 12-pdr. battery; whilst with the unarmoured main deck—as in the Majestic class—the 12-pdr. battery is actually safer. There are curious and capricious fashions in armour, just as there are in other matters; but the heavily armoured main deck, with a thin belt and thinner sloping deck, is unreasonable to a degree. The Germans and Americans have spent less weight than other nations in this armoured main deck craze

and profit correspondingly.* Even the Monmouth, with her 4-in. belt, which can be riddled by the 6·4-in. French gun at nearly 5000 yards range, has a $1\frac{1}{4}$-in. main deck some 60 ft. broad, the weight of which would have allowed the belt and casemates to be sufficiently thickened to make the vitals and guns safe from the 6·4-in. shot until the ships closed to 1500 yds. And the smallest gun by which the Monmouth is likely to be attacked is the 5·5-in., which will pierce her belt and casemates at over 3000 yds. As in the battleships, were the armour removed from the main deck, there is nothing that could be materially injured by pieces of shell passing downwards through a thin deck, whilst the top of the belt is so high above the water that there would be little trouble owing to admission of water. It will be very poor satisfaction to the stokers, who, whilst tending the fires, will run the greatest risk from splinters of shot which are liable to enter the stokehold, after piercing belt and "armoured" deck ($\frac{3}{4}$-in. !), to learn that their clothes, which are stowed immediately beneath the main deck, are safe from the effect of bursting shells. The Diadem class have been much criticised, but, at any rate, the 4-in. sloping deck renders engines and boilers practically safe from the 6·4-in.

It may not be too late to transfer some of the comparatively useless plating of the main deck of the County class to the slopes of the lower deck. The 4-in. belt can scarcely be modified, but would it not be possible to substitute 5-in. for 4-in. casemates in the ships which are not to be completed till next year? As pointed out last year, the quality of 5-in. plating is much superior to that of 4-in., so that the extra inch would render the guns safe to within some 2500 yds. of an enemy armed with 6·4-in. guns.

Proposal to reduce the thickness of the upper strake of the belt.

Besides reducing the thickness of the main deck, weight could be usefully saved in battleships by reducing the upper strake of the belt to 6 in., as is done in the U.S. battleship Georgia, etc. This would keep out all Q.F. shells, and would be quite as efficient for this purpose as the 9-in. plating of the London and the 8-in. of the King Edward. If, now and again, a shot from a very heavy Q.F. found its way through, very little harm would be done. The Germans and Americans in their new ships have only $5\frac{1}{2}$ in. to 6 in. just below the main deck, but the latter have substituted a 10-in. belt for the 11-in. belt of Georgia, but retain the 3-in. sloping deck.

Armour for the secondary guns.

Since last year the casemate has practically been abandoned in this country, and there are very few of the foreign armoured ships lately laid down that retain the casemate. The exceptions are the

* The American 19-knot battleships have an excellent 3-in. sloping deck. In none of their latest designs is the lower deck less than this.

American Milwaukee class of small armoured cruiser—a very unsatisfactory design—and a few of the main deck gun emplacements in French, Russian, and German ships. Generally, when it is decided to mount several guns on the main deck, the box battery with screens between and round the guns has been preferred. The exceptions are when only a few guns are required on the main deck, and there is not sufficient weight available to build a box battery. The Russians, in the Borodino class, have abandoned the main deck for the secondary armament, and have installed a number of 12-pdrs. there, behind a 2-in. protection. No other nation has yet followed them, though it is rumoured that in the latest British battleship designs all the secondary guns are on the upper deck. The 12-pr. battery is a very defective arrangement. The 2-in. plating is quite inadequate to stop a 6-in. shell even at the longest ranges, and these guns will be out of action before they can be brought into use at all. With regard to the protection of main deck batteries or casemates the thickness is steadily increasing. The latest British and American battleships, with guns on the main deck, have 7-in. box batteries, whilst there is no battleship that has less than 6 in.

Distribution of armour in the latest ships designed by Armstrong and Vickers.

In the Libertad and Constitucion, which are building for the Chilians by Vickers and Armstrong respectively, though the displacement is only 11,800 tons, and the speed 19 knots, both main deck box battery and upper deck casemates are 7 in. thick. These ships most wisely dispense with the heavy above-water decks, which overload some of our latest ships, and are content with ¾ to 1-in. plating covering in the top of the box battery. The necessity of keeping down the displacement, however, coupled with the provision of powerful engines to give high speed, whilst 2000 tons of coal is carried, has made it expedient to thin down the belt armour to 7 in., whilst the main barbettes are only 10 in. Also 10-in. guns take the place of 12-in. Added to this the belt before and abaft the citadel is only 3 in. These ships therefore have their secondary battery splendidly protected against even the heaviest Q.F. guns, but their thick armour is not up to the mark for resisting the 12-in. gun. They are capital ships for their displacement, and with their heavy armament of fourteen 7·5-in. guns entirely eclipse our Duncan class, which have the same speed and less protection everywhere except on the heavy gun barbettes and right forward. If another 3000 tons had been allowed, it would have permitted the belt and barbettes to be suitably thickened, and 12-in. guns supplied in lieu of 10-in.

The belt before and abaft the citadel.

For fifteen years Great Britain posed as the champion of unbelted ends, whilst France has always devoted a considerable weight of armour to the complete water-line belt. During the last five years

we have entirely altered our policy as regards plating the bows, and now apply great masses of armour to the sides of the ship between the fore barbette and the ram. Thus the King Edward has running to the bows a belt some 16 ft. broad and varying from 9 in. to 4 in. in thickness, whilst this lofty belt is covered in by the inevitable main deck of from 2 in. to 1½ in. Besides this there is the 1-in. lower deck, which takes the place of the 2½-in. under-water deck that was considered sufficient for the Majestic class.

Bow plating a luxury.

We have a number of "soft-ended" ships, such as the old Agamemnon, which has just been sold; and it would be satisfactory to ascertain by firing at them whether all this weight of armour is necessary at the extreme fore end of the ship. When, as in the Duncan class, the vitals are denuded to give this protection, we are strongly of opinion that the older plan is better. Even stripped of armour forward, and with her bows riddled, the Duncan could readily keep up 12 knots, and probably a great deal more, and hold her place in the line. But with two or three shot in the engine-room, stokehold, or shell rooms, she would have to drop out of action. The bow plating is more or less of a luxury, but an adequate belt in the centre of the ship is a necessity. Even the French themselves do not load their bows to the same extent that we have done in some of our latest designs, and Germans, Russians, and Americans all save on us here. In the Formidable we were content with a 3-in. belt forward as compared with 3·9-in. in the German ships, and 5-in. to 4-in. in the new American designs. Moreover, the Formidable is not loaded with the tremendous main deck of later designs, for her deck is but 1 in. thick, and only extends as far forward as the fore barbette. She is, in fact, one of the most satisfactory ships we have as regards distribution of the armour, especially in the protection of the engines, for the water-line armour is 9-in. Krupp steel, reinforced by a 3-in. deck. There is, however, a waste of weight in carrying the 9-in. belt to a height of 10 ft. above the water-line, and the Americans in their Georgia by having a 6-in. strake here can thicken their belt to 11 in. at the water-line without requiring extra weight. An upper strake of 5 ft. in breadth and 6 in. thick would have been ample. This would give enough weight to thicken the water-line, bring the casemates up to 7 in., or to provide a main deck box battery, for covering which the armour taken off the main deck and the backs of the casemates would more than suffice.

The upper deck guns and their protection.

In the original designs of Captain Cowper Coles in England, and of Ericsson in the United States, the typical armoured turret ship was furnished with one or more turrets, all on the upper deck, the loading gear and trunk for ammunition supply being protected by

the armour of the ship. It seems that once more this type is being reverted to. The following table shows the number of guns in turrets on the upper deck in recent designs :—

Battleships.	Upper Deck Armament in Turrets.		
	No. of Turrets.	No. of Guns.	Weight of Broadside from Upper Deck.
			lbs.
BRITISH— King Edward	6	4 12-in. 4 9·2-in.	4160
FRENCH— République	8	4 12-in. 12 6·4-in.	3690
RUSSIAN— Borodino	8	4 12-in. 12 6-in.	3600
GERMAN— "H" (Braunschweig)	6	4 11-in. 4 6-in.	2450
AMERICAN— Connecticut	6	4 12-in. 8 8-in.	4400
ITALIAN— Vittorio Emanuele	8	2 12-in. 12 8-in.	3200

The United States is alone in having a heavy main deck battery, but the broadside weight of metal thrown from the main deck of the Connecticut is only 1000 lbs., not one quarter of that discharged from the upper deck, and, generally speaking, four-fifths of the armament of all recently-designed ships is on the upper deck.

Importance of the turret.

The turret is therefore becoming increasingly important, and it is essential to a good design of ship that the installation of the turret guns and the arrangement of their armour should be of the very best. One simple test of the skill of the designer is the extent of reduction of the volume of the turret and barbette. Obviously, if the total content be small, it is possible, with a given weight of armour, to give far more thorough protection than if the structure is large. Moreover, the larger the structure, the larger the target, and the greater the chance of being hit. British designs come very badly out of this comparison :—

—		Guns.	Diameter of Turret and Barbette as viewed from enemy.	
			Turret.	Barbette.
			Feet.	Feet.
BRITISH	Royal Sovereign	2 13·5-in.	—	39 to 54
	Majestic	2 12-in.	*40 or †23	37½
	Formidable	2 12-in.	†23	37½
	King Edward	2 12-in.	†23	37
FRENCH	Gaulois	2 12-in.	25 (about)	18 (about)
	République	2 12-in.	26	21 to 18
GERMAN	Braunschweig	2 11-in.	†26	18 to 11
RUSSIAN	Sevastopol	2 12-in.	†25	25
UNITED STATES	Rhode Island	2 12-in.	†23	27

* When loading broadside on. † When loading end on.

It will be seen that whilst the diameter of the foreign barbette varies from 11 to 27 ft., the standard British size for our latest design is 37½ ft. Thus the British barbette is from 45 to 80 per cent. heavier for a given thickness than its foreign rival, and is easier to hit in the same proportion. All this for the heavy guns. With the 9·2-in. gun we have gone to the opposite extreme, so that the turret is 16 ft., the barbette 19 ft., and the lower portion of this latter consists of a tube only 3½ ft. in diameter. In all probability this latter is the best type design yet produced at home, its moderate weight and small size of target being excellent features. It is of course condemned by a certain school, who imagine that it is the easiest thing possible to burst a shell under the barbette, "which will blow the whole thing into the air." As a matter of fact, a whole shell room full of shells might be expended without succeeding in bursting one under the barbette, for first the direction must be accurate within 9½ ft.; second, the elevation must be correct within 2 ft.; and third, the shell must burst as much as 20 to 100 ft. from its point of entry (according to whether it is a broadside or a raking hit), which is almost impossible. A failure in any one respect is fatal. Lastly, if a heavy shell, such as a 12-in., did burst within 2 ft. of the barbette floor, there is very little doubt that no harm would be done inside. Whence, then, the common idea that the risk run is great? Because the vast majority of critics have never seen the effect of the bursting of a shell, and imagine that the damage done to material will be infinitely greater than it is. Similarly, to cut away *seriatim* an ordinary plate and angle structure supporting a roller path would require far more hits than are likely to be made in half-a-dozen actions. In the latest design emanating from British private yards, viz., those of the Libertad and Constitucion, the diameter of the barbette for two 10-in. guns is 22½ ft.

Rate of loading with large barbettes.

It might be urged that the rate of loading is better with a large barbette. There is no evidence on this point. The Germans pride themselves on their rate of loading and have small barbettes, and the smallest of all British barbettes, that for the 9·2, gives the highest speed of loading, and a very high rate of fire is expected from the Libertad and Constitucion. In fact, the small one-gun barbette turrets of the Cressy class can fire faster from a single gun than the large turrets for the 12-in. guns as fitted to the latest battleships firing from two guns. Naturally it is far easier to handle a 380-lb. shell than one weighing 850 lbs., but still there is no valid reason why the same type of turret which has proved so satisfactory for the 9·2-in. should not be adapted to the 12-in. We are confident that the great ordnance and

shipbuilding firms, if given an absolutely free hand, would, without exceeding the present weight of guns, barbette and hood, produce a design to give as great, or greater, rate of fire than that attained at present, with such improved protection as to render the guns safe from 12-in. shot at 3000 yards.

Protection of barbettes and turrets.

All nations have reduced the thickness of barbette and turret armour to a maximum of 12 in. There seems no valid reason for this save that everyone else has done it, and that since Krupp armour has come in it has become usual to limit the thickness of the armour to the calibre of the gun protected. This convenient rule seems based on the fact that 6-in. armour beats the 6-in. gun. Therefore, it is said, 12-in. armour should beat the 12-in. gun. But unfortunately even the meagre experiments that have taken place with 11-in. and 12-in. armour demonstrate most clearly that this is an utter fallacy. In the following chapter there are some interesting results of firing at plates of about 12 in. in thickness with both heavy and light projectiles, capped and uncapped. From these and previous experiments it seems that a 12-in. Krupp plate is penetrable at ranges as under :—

Weight of Shot.	Gun.	Range at which the following will penetrate a 12-in. plate.		
		Capped Shot. Direct.	Uncapped Shot.	
			Direct.	30° to Normal.
		Yards.	Yards.	Yards.
850 lb.	12-in. V=2800 . . .	6500	5500	3500
	12-in. V=2400 . . .	4500	3000	500
562 lb. (German)	11-in. V=2900 . . .	5000	3500	1000
	11-in. V=2500 . . .	3500	2000	—
500 lb.	10-in. V=2800 . . .	4500	2500	500
	10-in. V=2400 . . .	2500	1000	—
380 lb.	9·2-in. V=2800 . . .	3000	1500	—
	9·2-in. V=2400 . . .	1500	—	—

This is eminently unsatisfactory, and it is absolutely necessary to thicken the armour. If we allow of an increase of 33 per cent., and the extra weight could be saved easily enough by modifying the British design of barbette, we arrive at a 16-in. plate. There have been no experiments with Krupp plates of this thickness, but it is reasonable to suppose that such a plate would be proof against a 12-in. gun with 2800 f.s. velocity at 3000 yards. A very moderate obliquity of the target would completely baffle the 12-in. shot.

Turret armour as distinct from barbette armour.

The revolving hood of a turret need not have 16-in. plates. A 12-in. plate sloped back 40° from the perpendicular is quite sufficient for the front, and the side plates need be no more than some 8 in. There is a double advantage in sloping the front plate. First, more

resistance is obtained for a given weight of armour when attacked by uncapped shot, and, secondly, the capped projectile is completely defeated. We have every reason to believe that, without exceeding the weight of the Formidable's barbette and hood, a new design could be got out giving a rapid rate of fire with 16-in. armour on the circular barbette and 12-in. to 8-in. sloping on the turret and hood, and that this would give practical security against the 12-in. gun. Similarly the 9·2 barbette turrets for battleships should have 10-in. on the barbettes and 8-in. to 5-in. sloping on turrets. This would render them perfectly safe against 8-in. guns, and fairly so (at 3000 yards about) when attacked by guns of their own calibre.

Whilst we do not advocate any great increase in the thickness of a battleship's belt, we consider it better to put the extra metal required to protect engines, boilers, and the midship part of the water-line generally in the form of a very stout sloping deck at least 4 in. thick and consisting of Krupp cemented plates. Thus the shot which get through the 10-in. belt would encounter a fresh hard-faced plate inclined at an angle. Hitherto all deck plates have been non-cemented, and therefore relatively soft. When the thickness is as much as 4 in. the cementing process is efficacious. The proposed belt, narrowed to 12 ft. 6 in., and tapered to 7 in. at the upper edge, would be lighter than the Majestic's water-line armour. The smaller barbettes and turrets for the heavy guns would also be considerably lighter than the Majestic's, so that there would be weight available for introducing a small main deck battery protecting the lower parts of the 9·2 barbettes, and maintaining, say, a pair of 7·5-in. guns on each broadside. But if the main deck battery can only be provided at the expense of reducing the number of 9·2-in. guns to less than six on each broadside, we would prefer to dispense with the main deck battery and trust entirely to the 9·2-in. guns. The ships of the next few years will do their fighting in company with older ships well furnished with 6-in. guns, so that if the new ships provide the 9·2-in. fire the older ships will do the remainder. A modest weight of armour might be allowed before the fore barbette, but this will, of course, increase the displacement, and it is not considered desirable to do this unless it is demonstrated to be necessary by the result of shell practice at some of our old ships with unarmoured ends. Experiments are also absolutely necessary with thick plates for the barbette, inclined 12-in. plates for turret faces, and a 10-in. belt plate with sloping deck of Krupp cemented steel in rear.

Summary as to battleship armour.

The armoured cruiser cannot stand up against the 12-in. gun. That is clear enough. But what gun should her belt and turrets resist successfully? Most of the Powers reply, the 6-in. or 6·48-in.

Armour of the armoured cruiser.

The Americans have gone to 14,500 tons displacement, and with a 6-in. belt, reinforced by a 1½-in. sloping deck, the engines are barely safe from an 8-in. shot at 3000 yards. Still these ships have not much to fear if their water-lines be attacked at moderate ranges by the British 7·5-in., the German 6·7-in., or the French 6·48-in.; and their 8-in. main barbettes for 10-in. guns, with the turrets faced with sloping 9½-in. plates, are tolerably safe at 3500 yards from the 9·2-in. But the main deck battery and upper deck casemates with only 5-in. armour covering the sixteen 6-in. guns, can be pierced by the 6·7-in. and 6·48-in. at some 4000 yards. So that, notwithstanding the great displacement, the protection is not satisfactory—the armour covers too large an area. In the French Gambetta class, with eight double turrets on the upper deck, two with 8-in. and six with 6-in. armour, and only two casemates on the main deck, also with 6-in. protection, there is a 6-in. belt backed by a 2½-in. deck. Thus all the guns are safe from the 6·7-in., and engines, boilers and big turrets from the 8-in.; and this on a displacement 2000 tons less than the American ship. Excellent as is the French design, a considerable addition would be required to the displacement to give security against the 9·2-in., with which the latest British cruisers will be largely provided. These ships are already nearly as costly as battleships. If the 9·2-in. is to be resisted it must be by reducing the number of guns, those in the main deck casemates going first, and we should have a ship more or less of the Dupuy de Lôme type with all her armament in upper deck turrets. The slopes of the armoured deck could be made of Krupp cemented steel, and thickened up to 4 in. with weight saved from the main deck, whilst the belt would remain as at present tapering from 6 in. to 5 in. and 4 in. With twin gun turrets forward and aft, supported on each side by single gun turrets, a broadside of six 9·2-in. guns could be obtained, whilst there would be a long stretch of deck between the foremost and after side turrets, which would give space for 4-in. or 12-pdr. anti-torpedo guns unprotected except by shields, but being wholly in the open and well removed from the foremost and after groups of guns—at which the enemy's fire would be mainly directed—they would stand a fair chance of remaining intact even after the ship had been some time in action. Obviously such guns would not require much ammunition, and with small depôts suitably placed close to the guns they would not require many hands. Such a ship would be inexpensive to man as compared with the Drake or Gambetta, and neither of those ships could stand up against the twelve 9·2-in. projectiles per minute, which would come from the broadside of the better protected ship. At the beginning of the

action the latter would be hit by three times as many shells as she herself got in, but, like the hail of projectiles on the Merrimac, Monitor, or New Ironsides, these shells would do but little harm, and as gun after gun on her thinly-armoured opponent was silenced, the fire of the latter would rapidly decrease both in volume and in accuracy. There is no case in history of a well-protected ship, with few guns fairly well fought, being beaten by a badly protected vessel with a numerous armament of non-piercing guns; and there are many cases, especially in the American civil war, where a very few well protected weapons utterly defeated a more numerous but badly protected battery. We are, in fact, going back to the days when the Minotaur and Richelieu gave place to the Alexandra and the Duperré; the gun has beaten the plate, and in order to carry more protection the number of guns must be reduced.

The smaller armoured cruiser.

For a long time to come guns of 6 to 6·5-in. calibre will be much in evidence in existing ships, though absent from new designs, and in order to get more ships for a givén expenditure it will be necessary to have a smaller type of armoured cruiser. The endeavour should be to render such a ship safe against the 6·7-in. gun, to effect which 6-in. plating on belt and turrets is necessary. The thick sloping deck should be dispensed with, because no deck less than four inches thick is worth its weight for water-line protection. Such weight as is available should be put into the belt plating, which must be at least six inches, so as to get all the advantages of the Krupp process. For such a ship the armament should consist of 7·5-in. guns. She cannot expect to stand up to the heavy armoured cruiser, so that it is not worth while to sacrifice rapidity of fire in order to mount 9·2-in. guns. On the other hand, the 6-in. is insufficient, whilst the 7·5-in. would enable her to dispose of ships like the Devonshire, Condé, and Prinz Adalbert, she could also make something of a fight with the Drake, Gambetta, or West Virginia.

The best arrangement for guns would be to have twin gun turrets on the middle line forward and aft, supported by single gun side turrets, as in the heavy cruiser. The anti-torpedo 12-pdrs. would be placed along the sides. Thus the two types of cruisers would be similar, but the heavier would carry 9·2-in. and the smaller 7·5-in. The 6-in. gun would gradually disappear, for the scout class, if found successful, will carry nothing heavier than a 4-in., and will trust entirely to their speed should they encounter a heavy cruiser.

Summary.

To sum up, the guns have gained ground in the last three years, owing to the increase of velocity by some 300 f.s., and also owing to the introduction of the capped shot. During the same period the

quality of the armour has remained unchanged, and therefore its thickness must be increased.

Whilst the armour held the advantage in the early days of the general adoption of the Krupp process, it was lavishly extended so as to cover a far wider area of the ship's side; at the same time heavy armoured decks were added far above water. We can no longer afford to be thus lavish, since the armour, if not thickened, will be everywhere penetrated. So retrenchment must be the order of the day; we must retrace our steps, and go back to reduced areas of thickened armour, both in battleships and cruisers. The length and breadth of belts will have to be cut down, and superfluous armour high above water abandoned. Guns will no longer be mounted on the main deck, save perhaps in the heaviest battleships, where a modest box battery may be used. The main armament will be on the upper deck, in turrets, in which everything will be done to reduce the volume without impairing the rate of fire; the latter, indeed, needs to be improved, the object being to obtain the best protection to a small turret with a high rate of fire.

Two classes of armoured cruisers are likely to be perpetuated; but even the smallest will have a large displacement, be very costly, and, like the battleships, they will carry all their guns in turrets on the upper deck.

CHAPTER II.

Experiments with Armour Plates and Projectiles.

Armour, as at present manufactured, consists almost exclusively of nickel-chrome steel with cemented face, the hardening being carried out by the Krupp or some similar process. The French manufacturers still adhere to their own system, which, however, produces substantially the same results, so that it is rather a distinction without a difference than a rival process. In every case the manufacturer endeavours, by super-carburising the face and using the very best possible material throughout, to produce a plate with an exceedingly hard face and the toughest possible back. Introductory.

Plates as thin as four inches have been successfully treated by the cementation process, but there seems to be considerable difficulty in bending such plates to the complicated curves requisite for the face of a British casemate. Hence it results that the new casemates for the Royal Sovereign class, though five inches thick, are all of non-cemented material, and, therefore, decidedly inferior in resisting power to the 5-in. protection fitted to the Russian ship Retvizan,* which consists of cemented plates. These plates seem, however, to be applied to the box battery, and it is not clear whether the casemate plates are cemented or not.

As the gun is forging ahead of the plate, it is most necessary that experiments shall be carried out with very thick plates, or with a sandwich arrangement, the second plate being either at an angle, as is the case with a deck, or with the plates parallel, but with an air space between the back of one plate and the front of the other. In default of any such experiments, we can only give results at the thickest and thinnest plates fired at—viz., 12 and 4 inches respectively. The year has, in fact, been very barren of experiments pure and simple. Nearly all the trials which have taken place consist of reception tests of plates or shot. Some of the former are given, but in the latter case, as the tests take place against non-cemented plates, they are not of sufficient interest to be reproduced. The results of reception tests are devoid of interest, because when a plate is being tested the velocity is kept so low that the shot is completely beaten, whilst for a shot trial an inferior class of plate is used, which the shot pierces easily. The cap has at Paucity of new experimental data.

* See *Naval Annual*, 1900, pp. 326, 327.

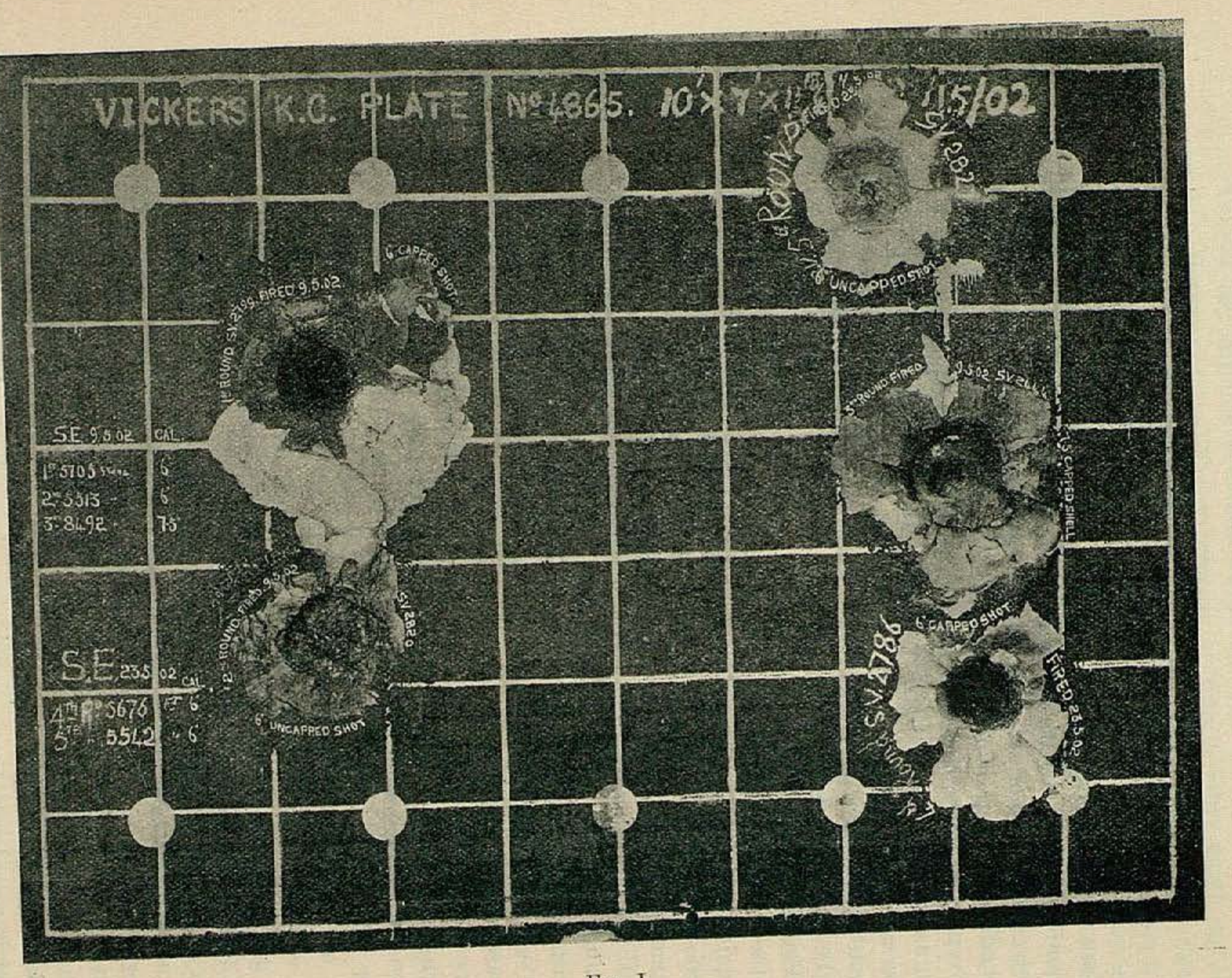


FIG. I.

Vickers 11·8-inch Krupp Cemented Plate perforated by 6-inch shot with Johnson cap.

length been adopted in Great Britain, and all nations have now decided to use this adjunct, it having been abundantly shown that it gives a decided advantage when attacking cemented plates. There have been no recent experiments with deck plates, and it is open to question whether more attention should not be paid to the quality of the steel, notably in the case of the sloping deck, on which the safety of engines and boilers very greatly depends. Although it may not be true, as has been stated, that the armoured decks of some recent ships are little superior to boiler plates, still there seems great scope for improvement in this direction.

Trials in 1902–3.

For the following data we must express our acknowledgments to the great firms of Armstrong, Krupp, Carnegie, and Hadfield. We are also especially indebted to Lieut. Dawson, of Vickers, and to Mr. Meigs, of the Bethlehem Company, United States.

Thick plates for belts and turrets of battle-ships. Capped and uncapped shot.

In the end of May, 1902, the *Times* devoted two columns in large type and a leading article to certain trials at Messrs. Vickers' range at Eskmeals, of which the principal one was the experimental firing at a 12-in. Krupp plate with 6-in. and 7·5-in. shot capped with the Johnson cap. The 6-in. shot perforated the plate, and much surprise was expressed thereat in very many quarters. When carefully analysed the result is not by any means as remarkable as some of the comments would lead one to suppose, but it was a useful and striking demonstration of the utility of the cap, of which, as our readers may possibly remember, we have more than once spoken most favourably.

TRIAL OF 11·8-IN. VICKERS KRUPP CEMENTED PLATE, No. 4685.
SIZE, 10 FT. × 7½ FT. MAY 9 AND 23, 1902.

Round.	Gun.	Weight of Projectile.	Projectile, capped or uncapped.	Striking Velocity.	Striking Energy.	By Tresidder's Formula. Penetration. Wrought iron.	Figure of merit.
		lbs.		f.s.	f.t.	inches.	
1	6-in. B.L.	105	Johnson Capped	2799	5705	23·6	2·00
2	6-in. B.L.	100	,, Uncapped	2820	5513	23·2	1·97
3	7·5-in. B.L.	205	,, Capped	2444	8492	23·8	2·02
4	6-in. B.L.	105½	,, ,,	2786	5676	23·5	1·99
5	6-in. B.L.	100	Firth Uncapped	2827	5542	23·3	1·98

RESULTS.—See Figs. 1 and 2.

Round 1.—Complete perforation, the shot remaining in the backing, diameter of hole, 6 ins.
,, 4.—Complete perforation, the shot remaining in the backing, diameter of hole, 6 ins.
,, 3.—Shot just failed to perforate, penetration 11½ inches. A large disc of plate nearly detached.
,, 2.—} Shot broke up on face of plate, a slight bulge in rear.
,, 5.—}

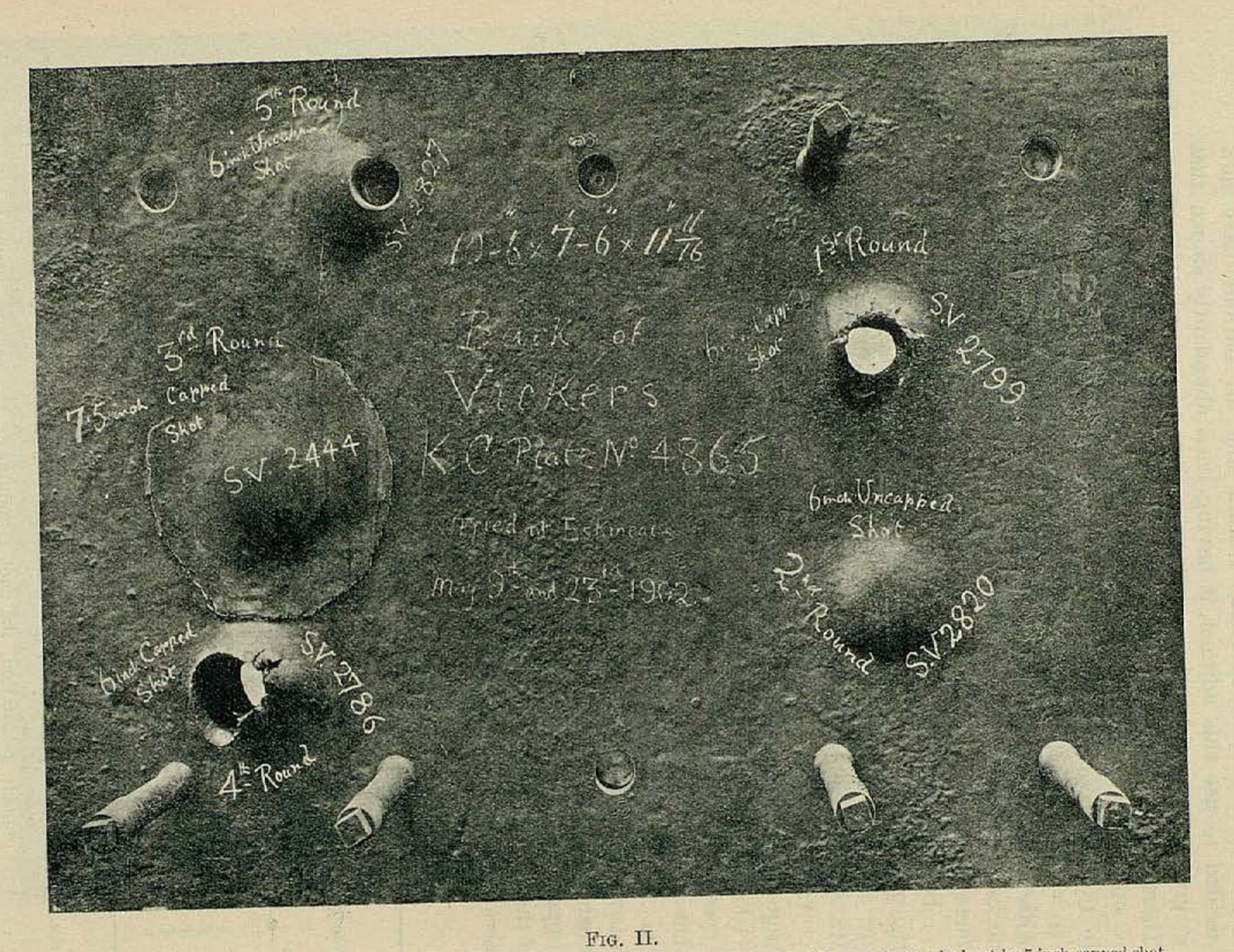


FIG. II.

Back of Vickers 11·8-inch Krupp Cemented Plate, showing perforations of 6-inch capped shot and disc nearly punched out by 7-inch capped shot.

We find, therefore, that, with a velocity of about 2800 f.s. and a penetrating factor by Tresidder's formula of 1·98 to 2·0, the 6-inch gun pierced the plate, whilst with 2444 f.s. and a penetrating factor of 2·02, the 7·5-in. gun only just failed. On the other hand, the uncapped shot broke up harmlessly. The plate was undoubtedly a very good one, and has since, we understand, shown its good quality when attacked by the 12-in. gun.

Two years ago we assessed the figure of merit of a 12-in. Krupp plate when attacked by uncapped projectiles as 2·33, which would make it equal to 28 ins. wrought iron; but last year a good Carnegie plate was defeated by a blow with penetrating factor 2·30. Again, we have assessed the increased penetrating power, due to a cap, at about 15 per cent. This would reduce the figure of merit of a 12-in. plate, when attacked by a capped shot, to almost exactly 2·0. Therefore, the capped shot should just have effected perforation, which was precisely what happened. Doubtless, this was aimed at by the Vickers firm, and we congratulate them on the perfect success of the experiment. The photographs show the good quality of the plate and the excellent behaviour of the capped shot. The yielding of the back is also clearly shown; the 7·5-in. shell nearly succeeded in punching out a disc. It must not be assumed that, because these results were obtained with 6-in. and 7·5-in. guns respectively, that a ship with 12-in. plates would be seriously threatened by such guns. The limit of effective range for obtaining perforation with the 6-in. gun and 2900 f.s. velocity is something under 200 yards, and for the 7·5-in. gun 1200 yards. The 9·2-in. gun is the smallest which seriously threatens a 12-in. plate. The results with the 6-in. shot were confirmed by some trials that took place abroad in which a 10-in. plate was pierced by 6-in. capped shot with a figure of merit of about 2·05.

The following trial took place at Indian Head, July 4, 1902, and is interesting as both capped and uncapped projectiles were used :—

11-in. turret plate for U.S.S. Maine. Failure of the cap at low velocity.

11-In. Curved Plate for Turrets of U.S.S. Maine.

Round.	Gun.	Projectile.		Striking Velocity.	Striking Energy.	By Tresidder's Formula.		Remarks.
		Weight.	Particulars.			Penetration.	Figure of merit.	
				f.s.	f.t.	inches.		
*1	10-in.	500	Carpenter Uncapped	1753	16,664	19·8	1·79	Projectile broke up. Penetration very small.
*2	,,	,,	,, ,,	1779	10,983	20·2	1·82	
*3	,,	,,	,, ,,	1853	12,010	21·3	1·93	
4	12-in.	866	Midvale Capped	1599†	15,368	19·0	1·72	
5	,,	868	Wheeler Capped	1641	16,323	21·4	1·95	Projectile broke. Penetration 6 ins.
6	,,	867	Carpenter Capped	1733	18,072	23·3	2·12	Projectile broke. Penetration 7 or 8 ins.

* For acceptance of plate
† Angle of impact 15½° from normal.

The resistance of this plate, when attacked by uncapped shot, might have been expected to be about equal to 26-in. wrought iron, and, if 15 per cent. be deducted when the cap is used, it gives 22 in. as the standard resistance to a capped shot. Yet the sixth round, which should have pierced 23·3 in., failed to penetrate, whilst the projectile (see Fig. III) broke up rather badly. The cap, in fact, virtually failed. We attribute this failure to the low striking velocity, which only rose to 1733 f.s. in the last round. The cap may have been of some little

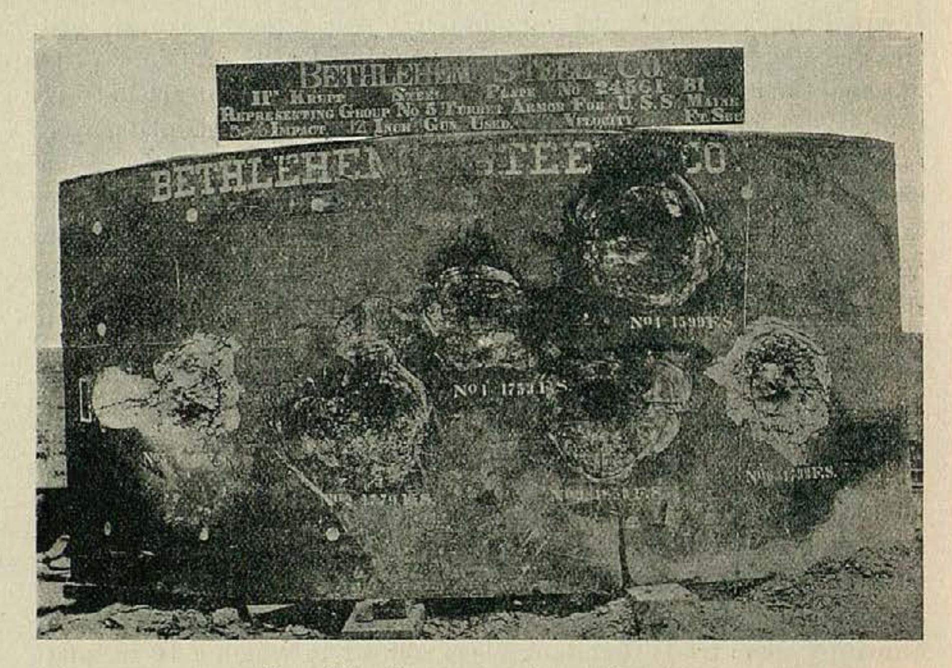


FIG. III.—BETHLEHEM STEEL COMPANY.

11" Krupp Steel Plate, No. 24,561 B.L. Representing Group No. 5 Turret Armour for U.S.S. Maine.
Gun used: 12".
Impact 5 (on the left) and Impact 6 (on the right) show failure of capped shot at velocity under 1800 f.s.

service, but the extra penetration was only about 5 per cent. Caps are of very little use when the velocity does not reach 1800 f.s.

Carnegie 11-in. turret plate for U.S.S. Missouri.

An 11-in. plate, made by the Carnegie Steel Company for the Missouri, was tested at Indian Head, July 10, 1902, by three rounds from the 10-in. gun, with velocities 1760 f.s., 1752 f.s., 1792 f.s., corresponding to a range of some 6000 yards for a gun with 2800 f.s. M.V., the figure of merit varying from 1·8 to 1·9. The plate passed this easy trial very satisfactorily. But when a turret is likely to be attacked by a 12-in. gun at 3000 yards or less, it is scarcely satis-

factory for those inside to know that it will resist the 10-in. gun at 6000 yards!

A flat plate, 10 in. in thickness, also made by Carnegie, was tested November 14, 1902. The velocity of impact differed little from that used in the trials of the 11-in. plate. Three rounds were fired from the 10-in. gun, with striking velocity 1745 f.s., 1742 f.s., 1740 f.s., the corresponding penetration of wrought iron being 19·7 in., and figure of merit 1·97. A fourth round was fired with a 511-lb. capped shot and velocity 1633 f.s., which should be equal to a penetration of 18·2 in. wrought iron (see Fig. IV.). The projectiles 10-in. Carnegie plate.

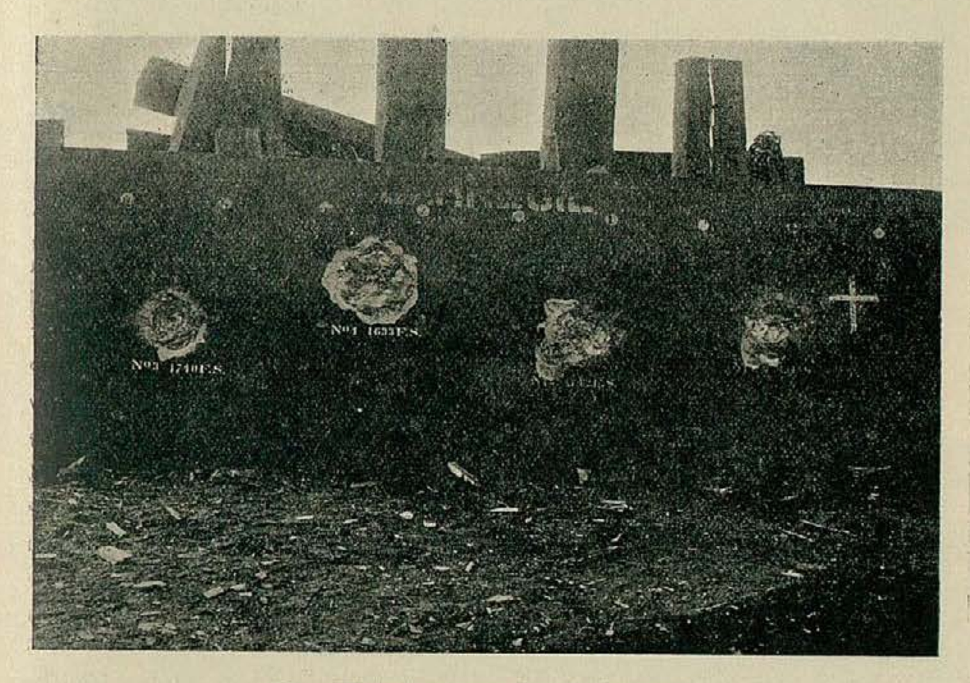


FIG. IV.—CARNEGIE STEEL COMPANY.

Flat 10-inch plate showing failure of capped shot at velocity 1633 f.s. (on the right of plate).

were all completely smashed on the face, and it is likely enough, to quote Mr. Hunsiker, "This plate is probably the best Kruppized plate that has been tested thus far at Indian Head." We should very much have liked to see an uncapped 10-in. shot fired at it with 2000 f.s. to 2050 f.s., and if it had stood this as well as a capped shot with 1850 f.s., we should heartily have endorsed Mr. Hunsiker's views. If the plate represents the belt of the Connecticut class, it would be more interesting still to fire at it in combination with a sloping deck plate, using a 12-in. gun and capped shot with velocity 2100 f.s. (4000 yards range with $V = 2800$ f.s.), the object being to

ascertain the thickness of deck required to stop a 12-in. shot which had traversed the 10-in. belt plating.

9·84-in. plate by Krupp exhibited at Düsseldorf.

We give particulars of the test of a very excellent plate exhibited by Krupp at Düsseldorf. It was fired at as long ago as June, 1901, and may possibly represent the barbette armour of the German battleships now coming forward.

PLATE B. 19.—11 ft. 11 ins. × 6 ft. 11 ins. × 9·84 ins.

Round.	Gun.	Projectile.		Striking Velocity.	Striking Energy.	By Tresidder's Formula.		Remarks.
		Weight	Particulars.			Penetration. Wrought Iron.	Figure of Merit.	
	inches.	lbs.		f.s.		inches.		
1	11·14	511*	Uncapped	1920*	13,080	21·6	2·20	Heads of projectiles smashed. Bodies in fair-sized pieces.
2	11·14	509	Uncapped	2005	14,203	23·2	2·36	
3	11·14	513	Uncapped	2002	14,271	23·2	2·36	

* The projectile is a very light one for the calibre; a projectile of the British type for this gun would weigh 675 lb., whilst 1730 f.s. with the heavy shot would be equivalent to 2000 f.s. with the light one.

This is a very good result, the test being a far more severe one than the American trials. The photographs (Figs. V. and VI.) show that the limit of resistance was nearly reached. Still, it is quite possible that the figure of merit might have been as high as 2·5, which would make the plate almost a record one. Of course, the great Krupp firm may be trusted to send their best plate to an exhibition, and it is a noticeable fact that a plate of 1901 manufacture was selected. There has apparently been no improvement in the last two years.

8·8-in. plates for belt of Bulwark class.

Reports of the reception trials of the nominally 9-in. plates (really 360 lb. per sq. ft. or 8·8 in.) for the Bulwark class of battleship have also come to hand. These plates have to stand three rounds from the 9·2-in. gun with 380 lb. shot, striking velocity 1900 f. s.; the corresponding penetration wrought was 20·1 in., figure of merit 2·28. The plates stood very well; their figure of merit may be guessed at 2·5, but the trials were not severe enough to determine the ultimate resisting power of the plates.

General results of trials of thick armour for bels and barbettes.

The general result of these trials is that a thick plate is safe against an uncapped shot of its own calibre at about a striking velocity of 2000 f s Looking at the very high velocity of modern guns this is eminently insufficient. When the Royal Sovereign was armed, 12 years ago, 2000 f.s. was a high velocity at ordinary fighting

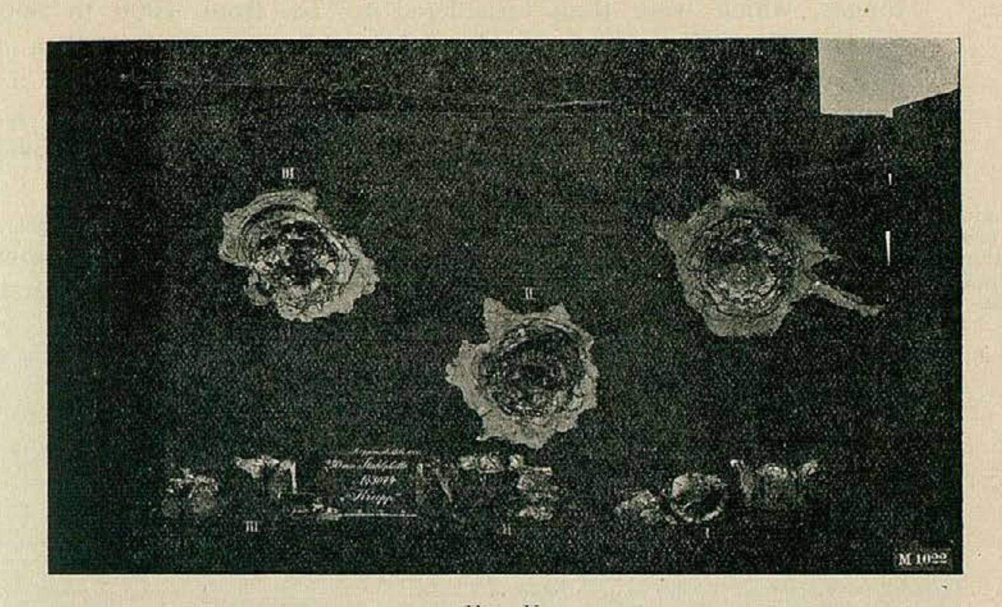


FIG. V.

9·84-inch Plate B, exhibited by Krupp at Düsseldorf, which kept out 11-inch shot with piercing power of 23¼ inches wrought iron.

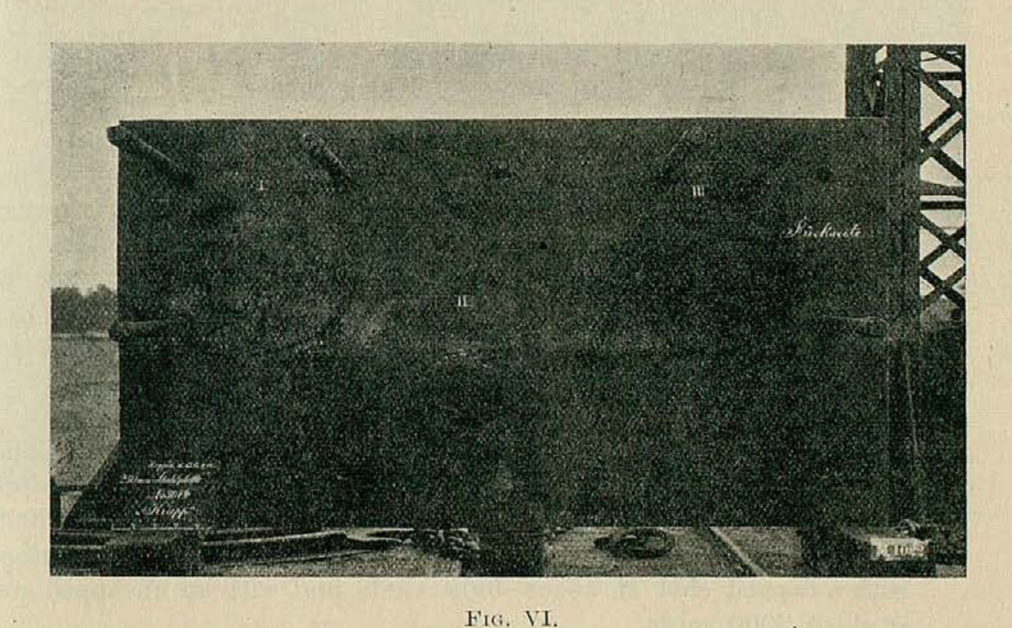


FIG. VI.

Back of 9·84-inch Krupp Plate B, showing (on the left) that a disc was nearly punched out by Round 1, piercing power 21·6 in. wrought iron.

ranges, which were then considered to be from 1000 to 3000 yards. Now that the probable fighting range may be taken at 2000 to 5000 yards, the heavy gun has to attain about 200 f.s. more velocity to effect equal penetration. But the velocity has increased at least 600 f.s., so that the heavy gun is entirely master of the situation.

Armour for protection of secondary guns.

Scarcely less important than the protection of the heavy guns is the armouring of the positions for the secondary armament. We give the following results of trial with armour of moderate thickness.

The 6·8-in. armour of the Chilian battleship Libertad was tested both with capped and uncapped shot from the 6-in. gun, and with a capped armour-piercing shell from the 7·5-in. gun.

6·8-IN. VICKERS K.C. PLATE (SEE FIG. VII.).

Round.	Gun.	Projectile.		Velocity.	Striking Energy.	By Tresidder's Formula.		Remarks.
		Weight.	Particulars.			Penetration. Wrought Iron.	Figure of Merit.	
				f.s.	f.t.			
1	6-in.	100	Elswick, uncapped . .	2110	3087	15·1	2·22	Shot smashed on face.
2	,,	101	,,	2124	3149	15·2	2·24	Do.
3	,,	107	Vickers, with Johnson cap	2116	3323	15·6	2·30	Through; punching piece of plate through backing and skin plate.
4	,,	100	Elswick, uncapped . .	2104	3073	15·0	2·21	Shot smashed on face.
5	,,	100	,,	2104	3073	15·0	2·21	
6	7·5-in.	205	Vickers A.P. shell, capacity 6 lb. powder, with Johnson cap	2107	6301	19·8	2·01	Broke up, but passed through.

The plate was uncracked after this severe trial, and was of excellent quality. The 6-in. uncapped shot had an impossible task; they would not have pierced a 6-in. plate. On the other hand, the capped shot would have pierced with less velocity, and the figure of merit against this form of attack would be about 2·2, whilst 2·3 was the factor of round 3. Still, even with a 6-in. gun giving 2860 f.s. M.V., which was the figure attained with a 34-lb. nitro-cellulose charge at these trials, the 6·8-in. plate would give security at 2000 yards. With the same velocity the 7·5-in. would effect penetration with a capped shot at about 4000 yards, and with an uncapped one at about 3000 yards.

Krupp-cast plates, 5·9 in. and 6·7 in.

The only novelty in 6-in. plates worthy of note are the "cast plates" produced by Krupp. These do not claim any specially high-resisting powers, but are said to be equal to face-

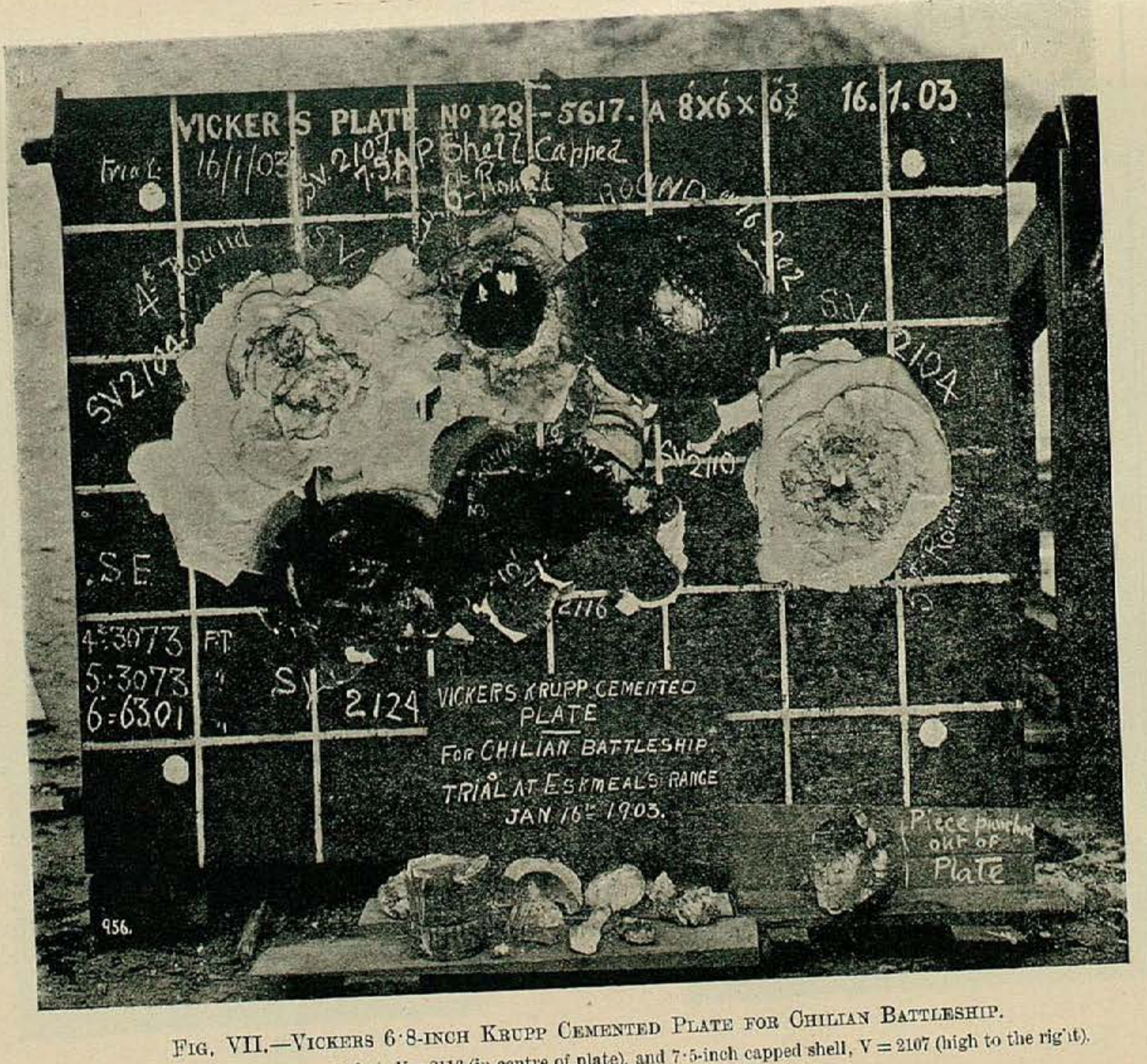


FIG. VII.—VICKERS 6·8-INCH KRUPP CEMENTED PLATE FOR CHILIAN BATTLESHIP.

Easily pierced by 6-inch capped shot, V = 2116 (in centre of plate), and 7·5-inch capped shell, V = 2107 (high to the right).

hardened rolled plates. The results given below scarcely bear out this claim.

Round.		Gun.	Projectile.		Striking Velocity.	Striking Energy.	By Tressider's Formula.		Remarks.
			Particulars.	Weight.			Penetration. Wrought Iron.	Figure of Merit.	
				lbs.	f.s.	ft.			
Cast plate, face hardened, 8ft. 2in. × 5ft. 11in. × 5·9in.	1	15 c.m. (5·9 in.)	Krupp (Uncapped)	112	1762	2479	12·2	2·06	Projectile smashed, no cracks.
	2	,,	,,	,,	1795	2512	12·5	2·12	Projectile smashed, but crack in rear bulge.
	3	,,	,,	,,	1840	2643	13·0	2·20	Projectile smashed, but crack in rear bulge.
	4	,,	,,	,,	1860	2698	13·2	2·24	Projectile smashed, no cracks.
	5	,,	,,	,,	1896	2806	13·6	2·30	Projectile smashed, but rear bulge considerably cracked; nearly through.
Cast plate, face hardened, 6ft. 11in. × 3ft. 11in. × 6·7in.	1	,,	,,	,,	2041	3249	15·0	2.24	Projectile smashed, no cracks.
	2	21 c.m. (8·26 in.)	,,	208	1644	3903	12·7	1.90	Projectile smashed, but rear bulge much cracked; nearly through.

The back of each plate is shown in the photographs—Figs. VIII. and IX. It is perfectly clear that there is not much to spare in stopping rounds 3 and 5 at the 5·9-in. plate, whilst the 6·7-in. plate is almost beaten by a 21 c.m. shot with the penetrating factor of 1·9. Seeing that a good forged plate should have a figure of merit of 2·7, it scarcely seems likely that the cast system will be utilised unless efficiency must be sacrificed to economy.

Capped shot tests.

Messrs. Vickers, on May 23, 1902, exhibited the power of one of their shot with Johnson cap by piercing a 6-in. plate with 105-lb. shot, v. = 1971 f.s.; figure of merit 2·3.

The following rounds were fired to demonstrate the advantage of a cap, and also for a trial of Hadfield's cast steel "Era" projectiles.

5-INCH K.C. PLATE. Hadfield Shot.

Round.	Gun.	Projectile.		Striking Velocity.	Striking Energy.	By Tresidder's Formula.		Remarks.
		Weight.	Particulars.			Penetration. Wrought Iron.	Figure of Merit.	
				f.s.	f.t.			
1	Gun. 4·13	32	Cast Steel "Era," Uncapped	2016	903	9·5	1·90	Shot smashed on face.
2	..	..	Do., Capped, with Hadfield cap	1960	854	9·2	1·84	Through.

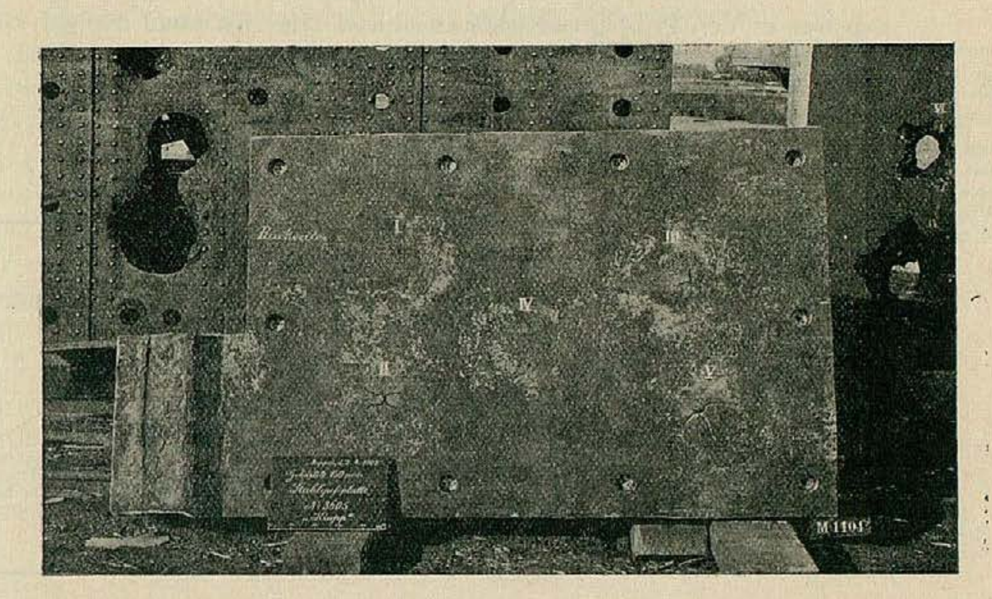


FIG. VIII.

Krupp 5·9-inch cast plate nearly pierced by 6-inch gun with piercing power 13·6-inch wrought iron (right and low).

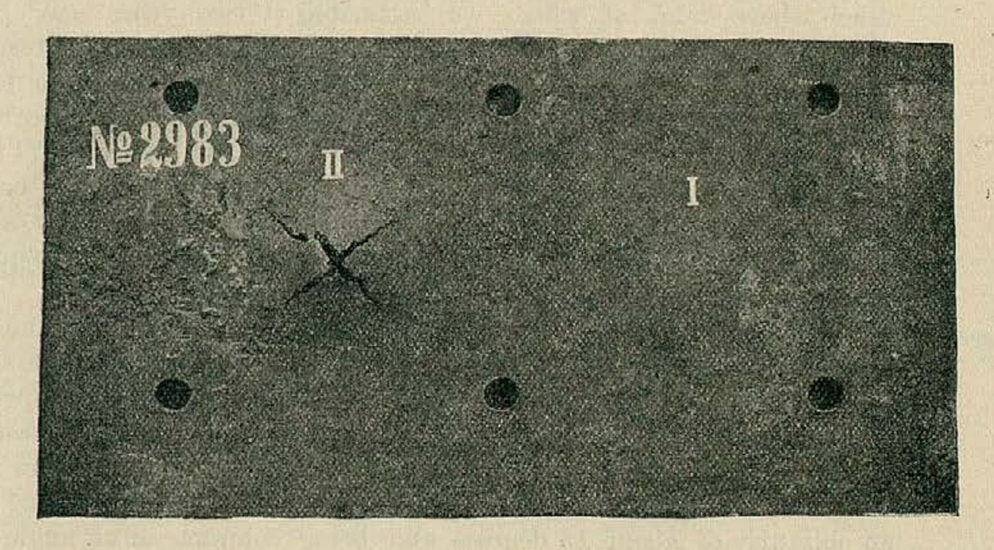


FIG. IX.

Krupp 6·7-inch cast plate nearly pierced by 8·26-inch gun with piercing power 12·7-inch wrought iron.

We have no information as to the quality of the plate, but the cap was evidently of great assistance, and the cast steel capped shot manufactured by the "Era" process did very well.

Hard-faced plates of 4 in. and less.

BETHLEHEM 4-INCH HARVEYISED NICKEL-STEEL PLATE. JANUARY 1903.
Capped and Uncapped Shot.

Gun.	Round.	Projectile.		Striking Velocity.	Striking Energy.	By Tresidder's Formula.		Remarks.
		Weight.	Particulars.			Penetration. Wrought Iron.	Figure of Merit.	
		lbs.		f.s.	f.t.	inches.		
4 in.	1	33	Carpenter Capped . . .	1336	409	5·3	1·33	The shot were smashed on the face. The back is not shown.
	2	,,	Midvale ,, . . .	1356	421	5·5	1·38	
	3	,,	Wheeler Sterling Capped	1463	490	6·1	1·53	
	4	,,	Midvale Capped, . . .	1436	472	5·9	1·47	
	5	,,	Carpenter Capped . . .	1503	517	6·4	1·59	
	6	,,	Wheeler Sterling Uncapped	1627	606	7·2	1·81	
	7	,,	Midvale Capped. . . .	1637	614	7·3	1·82	
	8	,,	Midvale Uncapped. . .	1697	660	7·7	1·93	

The plate had a very easy trial, and the capped shot gave no appreciable advantage at velocities under 1650 f.s. There is no evidence that the figure of merit of a 4-in. plate is likely to rise much above 2·25, at which we estimated it two years ago. At Düsseldorf, Krupp exhibited a 4·5-in. plate, which was tested as long ago as November, 1898. It was proved with the low velocity of 1752 f.s. from a 4·13-in. gun, and subsequently bore an impact from a 35-lb. shot from this gun with velocity equal to 2171 f.s. The figure of merit for this round is 2·5; but it seems to have been one of those exceptional rounds that are met with occasionally, and which do not really upset the rule that 4-in. plates have a low figure of merit.

Capped shot.

It has now been thoroughly established that if a shot strikes a cemented plate direct, or nearly so, with a velocity exceeding 1800 f.s., the use of a cap will add about one-sixth to the penetrative power. A shot capable of piercing a 6-in. plate, uncapped, could be easily driven through a 7-in. plate if a cap was used. But the cap loses its value when the impact is oblique, the loss of efficiency beginning at an obliquity of about 15 degrees, and being complete at an angle of about 30 degrees. The function of the cap being to preserve the point of the shot or shell intact, there is usually complete success or complete failure; that is, either the one-sixth advantage is gained or nothing. There are, however, exceptions to this rule; and more than one instance has occurred when the obliquity was between 20 degrees

and 30 degrees and the velocity nearly as low as 1800 f.s., where there was some appreciable gain, but nothing like one-sixth.

The fact that the cap is of little or no use when the velocity falls to 1800 f.s. seriously handicaps the smaller guns, and puts the older low-velocity guns completely out of court. Suppose that a 6-in. and 12-in. gun both have a muzzle velocity of 2600 f.s., caps would be useful to the 6-in. gun up to 2200 yards, and to the 12-inch up to 5000 yards. Again, an up-to-date 12-in. gun, with velocity 2800 f.s., can use a cap profitably up to 6000 yards; whilst the 13·5-in. gun, which forms the principal weapon of 15 of our "first class battleships,"* with its feeble muzzle velocity of 2016 f.s., can only use it up to 1800 yards. In other words, the cap is of no use to the 13·5-in., gun, as nearly all the fighting will take place outside 1800 yards. For the same reason the cap is of no use to the following :— Cap only useful to high velocity guns.

4·7-in. Q.F.,
6-in. Q.F.,
6-in. VII. and VIII. (only inside 2000 yards).

The guns in the British service that really profit by it are the 7·5-in., 9·2-in., and 12-in. Most foreign guns have higher velocities than ours. This is especially the case with French, Russian and American guns. The French use lighter projectiles than we do which, for a given striking energy, get a little more penetration. But even if the muzzle energy be greater, more energy is lost during flight, especially with light projectiles, so that if there is any gain it is with the heavier guns, where the advent of the cap certainly benefits the gun with light shot most. The new French ships, with the 1896 pattern 6·46-in., will profit by the cap at short and medium ranges, as also the Russian that carry 50 calibre 6-in. guns; but, generally, there is little profit to guns under 7-in. calibre. The question of the disability of the capped projectile, owing to its failure on oblique impact, was dealt with two years ago, when it was demonstrated that under average fighting conditions 50 per cent. of the hits will be sufficiently near the normal to benefit by the cap. From this it follows that in considering protection against the shot from heavy guns the cap must always be reckoned with; but with armour devised to give protection against light guns the cap is not of any great moment.

It must not be forgotten that even when the penetrating power of an uncapped shot is sufficient to carry it through the armour, a cap would still be advantageous, for a capped shot would come

* So called in Parliamentary Return.

through with far more energy and do more damage inside. Moreover, the use of a cap would enable an armour piercing shell to be substituted for a shot where there was some reserve of piercing power, and the cap would give the shell more chance of carrying its bursting charge through. Once more it is the heavy gun that gains here. Such a gun as the 6-in. will seldom find any armour against which it has a reserve of piercing power, at any rate, not for new ships; but the 9·2-in. armour-piercing shell, when attacking 6-in. or 7-in. armour, should decidedly benefit by a cap.

The rule-of-thumb computation that the cap adds one-sixth to the piercing power does not apply exactly to all guns. Seeing that the cap acts by neutralising the effect that the hard face of the plate exercises on the point of the projectile, it is natural that the cap should be most valuable when the hard face is most formidable. It has been abundantly proved that the hard face is most useful to plates of from 6-in. to 9-in. thickness. Here it is, then, that the effect of the cap is most notable. The high figure of merit of a 6-in. K.C. plate is mainly dependent on the fact that the point of the projectile is always broken until the piercing power reaches a very large proportion to the thickness of the plate. Directly the point remains unbroken the special excellence of the plate disappears.

Resistance of Krupp-cemented armour.

It may be useful to give a short table showing the estimated resistance of Krupp cemented plates, as compared with wrought iron plates, and also the corresponding resistance to capped projectiles, striking within 20° of the normal, and with not less than 1800 f.s. velocity.

RESISTANCE OF KRUPP CEMENTED ARMOUR.

Thickness of Plate.	Equivalent to Wrought Iron when Attacked by		Figure of Merit.	
	Capped Projectiles.	Uncapped Projectiles.	Capped Projectiles.	Uncapped Projectiles.
Inches.	Inches.	Inches.		
4	7½	9¼	1· 9	2· 3
5	10	12	2· 0	2· 4
6	13½	16	2·25	2· 7
7	15½	18	2· 2	2· 6
8	17	20	2·15	2· 5
9	19	22	2· 1	2·45
10	20½	23½	2·05	2·35
11	22	25½	2· 0	2· 3
12	24	27½	2· 0	2· 3

The 6-in. plates have the highest figure of merit, and those thinner or thicker do not show so well. The difference between maximum and minimum figure of merit is more marked with uncapped than with capped projectiles.

The table given below shows the advantage gained by increasing the power of guns of various calibres. Three muzzle velocities are chosen—(*a*) 2800 f.s., (*b*) 2600 f.s., (*c*) 2400 f.s.—as representing:—(*a*) Guns now being mounted; (*b*) Guns mounted within the last five years; (*c*) Guns five years old or more. There are, of course, older guns afloat, such as the 13·5-in. British gun, the penetration of which is exactly equal to that of an (*a*) 10-in. gun, and the 6-in. Q.F., which, as regards penetration, is between the 5-in. (*b*) and (*c*); but these must almost inevitably be replaced, unless the ships that carry them are relegated to the third or fourth rank. There is this to say for the old pattern 6-in.—its newer rivals also have inadequate penetration, so that, before very long, as the new ships with thicker armour become more numerous, the battleship guns of this calibre will be reduced to spattering the outside of an opponent's armour with fragments of shells. Penetrating power of guns of various calibres with capped and uncapped projectiles

It is considered that 3000 yards is a useful fighting distance, and that it is no use loading with piercing projectiles unless an uncapped shot will pierce at this range. The Table refers exclusively to 3000 yards.

PENETRATING POWER OF GUNS OF VARIOUS VELOCITIES AT 3000 YDS. RANGE WITH CAPPED AND UNCAPPED PROJECTILES.

In all cases the British or heavy type of projectile is assumed to be used.

Gun.	Muzzle Velocity.	Remaining Velocity. 3000 yards.	By Tressider's Formula. Penetration. Wrought Iron.	Penetration. Krupp Cemented Plates. Direct Fire.		Remarks.
				Capped. Shot.	Uncapped. Shot.	
12 in. (850-lb. shot)	f.s.	f.s.	ins.	ins.	ins.	The following ships have guns of these types:—
(*a*)	2800	2300	35·0	18	16	Hindustan, Connecticut, République?
(*b*)	2600	2120	30·6	16	14	King Edward, Iena?
(*c*)	2400	1940	27·5	13½	12	Majestic, Suffren?
11 in. (650-lb. shot)						
(*a*)	2800	2240	30·5	16	14	
(*b*)	2600	2085	27·8	13½	12	Braunschweig?
(*c*)	2400	1910	24·3	12	10½	
10 in. (500-lb. shot)						
(*a*)	2800	2180	27·0	13½	12	West Virginia.
(*b*)	2600	2030	24·0	12	10½	Pobieda.
(*c*)	2400	1870	21·2	10	8½	

PENETRATING POWER OF GUNS OF VARIOUS VELOCITIES AT 3000 YDS. RANGE WITH CAPPED AND UNCAPPED PROJECTILES—*continued*.

In all cases the British or heavy type of projectile is assumed to be used.

Guns.	Muzzle Velocity.	Remaining Velocity. 3000 yards.	By Tresidder's Formula. Penetration. Wrought Iron.	Penetration. Krupp Cemented Plates. Direct Fire.		Remarks.
				Capped. Shot.	Uncapped. Shot.	
9 in. (360-lb. shot)	f.s.	f.s.	ins.	ins.	ins.	The following ships have guns of these types:—
(a)	2800	2100	23·0	11½	10	King Edward (about).
(b)	2600	1960	20·8	10	8½	Kaiser class (about).
(c)	2400	1825	18·7	8	7½	
8 in. (250-lb. shot)						
(a)	2800	2030	19·5	9½	8	Georgia.
(b)	2600	1890	17·5	8	7	
(c)	2400	1740	15·5	6	6	
7 in. (165-lb. shot)						
(a)	2800	1950	15·9	7	6	Connecticut.
(b)	2600	1810	14·2	5½	5½	
(c)	2400	1740	12·5	5	5	
6 in.* (100-lb. shot)						
(a)	2800	1810	11·9	5½	4¾	Suffren, République, &c., have 6·4-in., which just fail at 6-in. plates.
(b)	2600	1680	10·7	4½	4½	Formidable and recent armoured cruisers. Also recent Russian ships.
(c)	2400	1550	9·4	4	4	Kaiser class.
in.* (60-lb. shot)						
(a)	2800	1680	9·2	4	4	
(b)	2600	1570	8·2	3½	3½	The 6-in. Q.F. in all ships up to Canopus class has this power, as has also the French 5·5-in. Q.F. in Charlemagne and older ships.
(c)	2400	1440	7·2	3	3	

* These guns will pierce about ⅕ greater thickness of K.N.C. than of K.C. plates with uncapped projectiles.

The last column is the most important one. It shows clearly enough the superiority of the heavy gun. Thus the 12-in. gun pierces twice as much as the 8-in., and three times as much as the 6-in. Both the 6-in. and 5-in. are completely out of court when 6-in. armour has to be pierced. The high velocity 6-in. is barely effective against hard-faced 5-in. plating. Against 5-in. K.N.C. armour an (*a*) 6-in. gun would just suffice, but it would fail against 6-in. K.N.C. A gun of 7·5-in. calibre, even of the (*b*) type, would

pierce 6-in. K.C. armour readily enough, but against 7-in. plating there is scarcely sufficient margin. The best 8-in. gun is only just effective against 8-in. plates, and can do nothing against a 9-in. belt; so that where the 7·5-in. fails the 9·2-in. should be resorted to. An (*a*) gun of this type, such as that for the King Edward, will just be effective against the 10-in. plating of the Kaiser or Pobieda, The German 11-in. gun for the new ships, being probably of the (*a*) type, is adequate for dealing with existing armour, but the 12-in. gun has a margin for meeting an increase in the thickness of the belt and heavy gun barbettes. This gun would also do much more damage after penetration, besides which it would succeed on oblique impact where the lighter gun would fail.

CHAPTER III.

Progress in Guns, Mountings, and Gunnery.

Progress in the last fifteen years as regards lengthening guns.

In the year 1887 a new series of heavy gun designs was produced in France of a very remarkable character as regards their length. Up to that time the standard length for guns was some 30 cals., but the new French designs showed a length of 42 cals. to 45 cals. This was a very bold innovation, and for some time the French designs were not generally copied. Thus the heavy guns of all the ships built under the British Naval Defence Act of 1889–94 were of the old 30-cal. type. The Russians continued ordering 30-cal. guns for two or three years, and then only went as far as 35 cals. in 1890, to be followed, however, by 40-cal. and 45-cal. guns in 1895 and 1898; and the American ships completed as late as 1900 still had 35-cal. guns as their principal armament, whilst their newest designs are for 40-cal. guns.

The first British ship with 40-cal. heavy guns did not commission till 1901, and as yet we have no 45-cal. 12-in. guns completed, much less supplied to ships; but they will form part of the armament of some of the ships building, and we have some 45-cal. 9·2-in. guns afloat. In the medium calibres, however, the British Navy came to the front at first. The 40-cal. 6-in. Q.-F. gun, designed by the great Elswick firm, was a prominent feature in the armament of the Naval Defence Act ships 1890–94, and numbers of these guns were supplied in 1890–91, at which period the French had only 30-cal. slow-firers as secondary armaments. The French speedily followed, however, with their 1891 designs of 5·5-in. and 6·5-in. Q.-F. of 45 cals., the latter a very superior weapon to the British 6-in. But most of their battleships up to 1898 were given the 5·5-in. gun, which, though of superior type and higher velocity than the 6-in. Q.-F., was actually inferior in effect, owing to its relatively small size and light projectile. The first British ship armed with 45-cal. Q.-F. guns was the Formidable, commissioned in 1901. The Germans are still completing ships with 40-cal. 6-in., although the Russians, following the French, adopted 45-cal. guns some years ago. The Americans had 40-cal. Q.-F. guns up to 1900, but are now manufacturing guns of 50 cals. in length. At

present all nations seem pretty well agreed that from 40 cals. to 45 cals. is the best length for a heavy gun, and 45 cals. to 50 cals. for a lighter one.

The practical effect of the improvement of guns is to give the present day weapon as nearly as possible twice the energy of its 30 cal. predecessor, as is shown in the following table:— Contrast between the 30-cal. gun and the guns now being made.

Gun.	Length.	Velocity.		Energy.		Penetration. Uncapped Shot.			
						Muzzle.		3000 yards.	
		Muzzle.	3000 yards.	Muzzle.	3000 yards.	Wght. Iron.	Krupp Steel.	Wght. Iron.	Krupp Steel.
		f.s.	f.s.	ft.	ft.				
6-in. (100-lb. shot)	30 cals.	2000	1335	2777	1237	13·8	5½	7·6	3½
,, ,, ,,	50 ,,	2900	1870	5840	2428	24·2	10½	12·5	5¼
12-in. (850-lb. shot)	30 ,,	2000	1630	24,710	15,680	28·5	12½	21·0	8½
,, ,, ,,	45 ,,	2800	2300	45,220	31,210	47·3	21	35·0	16

Although the piercing power at 3000 yds. range does not increase *pro ratio* with the energy, it is still increased by about two-thirds, and more than this for the heavy gun attacking Krupp armour.

As the relative power of two guns when using common shell may roughly be assessed by a comparison of the striking energy, it may be said that a shell from a 5-in. gun of the new type would be equivalent to one from a 6-in. gun of the old, whilst the effect of a shell from a 9·5-in. gun of 50 cal. would be about the same as that of a similar projectile from the old pattern 12-in. And when attempting to pierce armour, a modern 8·5-in. gun would give equal penetration to the old-fashioned 12-in., whilst a 4½-in. gun might be substituted for the 6-in. Or if a modern gun of half the weight of the old 30-cal. gun was exchanged for it, the effect of a single round would be about the same.

The above refers to the effect of single rounds. There is, besides this, the great gain in rate of hitting, which for a 40-ton 12-in., as compared with a 20-ton 8·5-in., would be at least four to one; and though the gain would not be so striking with the lighter guns, it would still be very material. In the above calculations the effect of flatness of trajectory in giving more hits has been allowed for. Summing up, the substitution of a modern gun for one of 30 cal. and 2000 f.s. velocity would in some cases double, and in others would treble or even quadruple, the fighting value of the gun armament, whilst the weight would be reduced.

How existing ships are affected.

In the official lists of British first-class battleships we have the following: 8 Royal Sovereign class, 2 Trafalgars, 1 Renown, 2 Centurions, 6 Admirals, 1 Sans Pariel; total, 20 ships. All these vessels have 30 cal. heavy guns, viz., 56 13·5-in., 12 10-in., 4 16·25-in., 4 12-in. If a rearmament of any of these ships was proposed without increasing the power of the heavy guns, it would be natural to substitute 10-in. guns for the 13·5-in., and 8-in. for the 10-in. But we have no modern guns of either calibre, and as it is desirable to improve the power of the guns wherever possible, the 12-in. gun might take the place of the 13·5-in., and the 9·2-in. that of the 10-in. By this substitution some weight would be saved in the guns, especially in the case of the 13·5-in., which is 17 tons heavier than the modern 12-in., and there would be a saving in the weight of ammunition to about the same extent. The new 12-in. guns would fire from twice to three times as fast as the old 13·5-in., and would pierce 16 ins. of Krupp steel at 3000 yds. as compared with 11 ins. Thus, from the point of view of the offensive power of her heavy guns, the effective hits of the Royal Sovereign would be more than trebled, for owing to the high piercing power of the new guns, most of the hits would go home, whilst those from the 13·5-in. would often fail to penetrate. But it would be impossible to introduce the 12-in. gun and mount it satisfactorily without removing the present enormous barbettes, which measure some 140 ft. in circumference, and have 17 ins. of armour, substituting therefor the latest type of barbette and turret, as approved for the newest ships, by which there would also be a reduction in weight and an immense gain in protection. It is true that such a drastic alteration would be very expensive, and would take a long period, but the gain in fighting power would be very great. At present four Royal Sovereigns take up eight cables in the line, and might at 3000 yds. put in five hits from the 13·5-in., and fifty from the 6-in. Q.F. in four minutes. Two re-armed ships would take up only four cables space, and would put in about eight 12-in. and twenty-five 6-in. Q.F. hits in the same time. Against all existing battleships the 12-in. projectiles would pierce the thick armour easily, whilst the 13·5-in. would not. Therefore, all that the latter could do would be to sweep away the secondary guns, for which shell would suffice, and the five hits on the ship might disable two of the enemy's heavy Q.F.'s Two of the fifty 6-in. shell might burst in casemate ports or hit gun muzzles and disable two more Q.F.'s Total effect of the fire of four existing ships on enemy's guns, four Q.F.'s disabled.

On the other hand, of the eight 12-in. projectiles coming from the two rearmost ships one might be expected to hit a barbette,

where at least one heavy gun would be disabled. And the other six would do at least as much damage to the protected secondary guns as the five 13·5-in. Besides this, there is a fair chance of one water-line hit from the 12-in. piercing the belt and doing the most serious injury between wind and water. The 6-in. would only do half the damage inflicted by the unaltered ships, and might be expected to disable one Q.F. Total effect, one heavy gun disabled, three Q.F.'s, to say nothing of the chances of piercing the belt. Not only is this comparison in favour of the two re-armed ships, taking a peace rate of hitting as the basis, but directly the 13·5-in. guns are exposed to fire, the large target they offer and its vulnerability will cause them to go rapidly out of action, whilst the 12-in., with a much smaller and more invulnerable target, will continue their fire comparatively unimpeded. In the above it is assumed that the enemy's vessel has her secondary armament protected against the British 40-cal. 6-in. Q.F., for which a 4-in. plate will suffice. There are very few ships that have not this amount of protection.

Of course the relatively weak water-line armour (18-in. compound) of the Royal Sovereign would remain in the re-armed ship, and her speed would not be bettered, so that the ship as altered, though twice as good as the original, would be still much inferior to a new ship. From which it may be gathered that three new ships would be an overmatch for our eight Royal Sovereigns, taking into consideration that it would not be difficult for the three with their superior speed to dispose of the eight more or less in detail, besides which there would be no fight at all if the three wished to avoid action. And, speaking generally, when guns, armour, engines and boilers, are all out-matched by greatly improved new designs, the only wise course appears to be to build a new ship and turn over the highly-trained officers and men manning the old one to a vessel which will give full scope to their skill.

Means by which the improvement in guns has been attained.

There are many factors which go to make up the improvement which has taken place in guns. The most notable, with reference to the exterior appearance and dimensions of the gun, is the length, which has been already mentioned. This gives more space for the charge and more length of travel to the projectile, thus allowing the gas pressure to be more fully maintained, from which a high velocity results. There is, however, another method of securing space for the charge, which has been largely adopted in England and America, and which does not entail lengthening the gun. This consists in enlarging the chamber. We cannot give exact particulars of the extent to which this is carried out on the Continent, but in the United States it is generally on much the same scale as that adopted

in England, where a transverse vertical section of the chamber has nearly twice the area of a similar section of the bore, whence it results that a chamber 7 cal. long on the British principle has about the same content as 13 cals. of the bore. In consequence, the length of ramming is shortened by 6 cals., as compared with an unchambered gun, and the charge is nearer to its work, so that the inconvenient and sometimes dangerous waves of pressure which result from igniting a large charge in a very long and narrow chamber are obviated. A 45-cal. British or American gun has a chamber about one-third the capacity of the bore, and this large chamber is found to be decidedly advantageous as regards the regularity of ballistics. When the propellant is confined in a small chamber without much air space it is possible to get high ballistics, but there is a great tendency to irregularity in the velocity. If the temperature is high the pressure rises to an inconvenient degree, whilst at a low temperature the velocity is much reduced. With a small chamber the effect of wear in a gun is also very marked. For this reason alone a small chamber is inadmissible when using cordite, and there is no evidence that nitro-cellulose behaves better in a small chamber when the gun is worn, though more rounds can be fired before the wear becomes serious.

The metallic cartridge and large chambers.

There are many difficulties in providing a large chamber when a metallic cartridge is used, as is the case with all guns of 6·5-in. calibre and below on the Continent, for the largest diameter of the chamber being at the rear, a large breech screw is inevitable. Thus a 6-in. gun fitted for metallic case would need the same sized breech screw as a 7-in. or 7·5-in. gun with a chamber choked in at the rear end. If a short case is used, as in the German guns up to 11-in. calibre, it would be possible to increase the diameter of the chamber beyond the fore end of the case, but this has never been done, owing probably to the complicated nature of the design. The advantage gained by using a case is that there is no sticking of the breech. But the case has to be extracted, which takes time, and the disposal of the empty cases is a most troublesome problem. Although there is no doubt that there has been difficulty in rapidly working a De Bange obturator, which will be alluded to later when dealing with rate of fire, there is every reason to believe that the trouble experienced will be surmounted, if this has not already been done.

Method of attaining the high ballistics secured by modern guns.

Although the provision of a large chamber and a long bore are important factors in the design of a gun intended to give high velocity, the progressive burning of the propellant is more important still. It is in this direction that the greatest progress has recently been made. In the 30-cal. gun a comparatively quick powder was

used, which ignited rapidly and gave a high pressure whilst the shot was travelling through the first 2 or 3 cals. of the bore. The pressure then began to fall because the production of fresh gas was not in proportion to the extra volume to be filled as the shot moved forward. Thus there was a rapidly diminishing pressure, which was reduced from 17 tons some 3 cals. up the bore to 3 or 4 tons only at the muzzle. With the new type propellants, such as nitro cellulose and tubular M.D. cordite, the production of gas keeps pace with the enlargement of volume caused by the advance of the projectile, and the pressure is maintained at its maximum for as much as 10 cals. up the bore, or even more. From that point the fall is still gradual, and the muzzle pressure may be as high as 8 to 9 tons. The maximum pressure being limited to 17, or at the most 18, tons in both the long and short guns it is evident that the extra energy in the new gun can only be obtained by high forward and chase pressures, with also a high muzzle pressure entailing a tremendous blast from the muzzle.

Blast from new type guns.

The blast is a very serious factor, the effect of which is often much under-estimated. The gas issuing from the muzzle of a modern 6-in. gun is equal in amount to that developed on the bursting of a 12-in. powder-filled common shell. Moreover, it is all poured out in one direction, whilst the shell gas is able to dissipate its energy in all directions. Marvellous things are expected from the gas of a shell, such as the displacing of the floor of a hostile barbette, etc., whilst surprise is expressed if the blast from a 6-in. gun makes a sighting hood within 30 ft. of the muzzle untenable. Given a 45-cal. gun, with a heavy blast at the muzzle, there is evidently great advantage to be gained by adding 5 cals. to the length. Not only will the blast be diminished, but when a broadside gun is trained round on the bow or quarter the blast will be carried clear of the ship's side.

But even with the longest guns a heavy blast is almost inseparable from high velocity, and it is a most important matter guns should be so placed that the sighting positions of those most advanced are not interfered with by those firing past them. When a turret amidships is flanked by a pair of sponson turrets on each side of it the blast of the sponson guns seriously interferes with the sighting hoods of the big turret when all are firing ahead or astern. Again, the big guns, unless very long, will, when trained past the beam, greatly affect the laying of the sponson guns. The Germans have a small sighting port in the front plate of the turret, and it seems quite possible that a gun might be sighted in this way when the sighting hood is untenable.

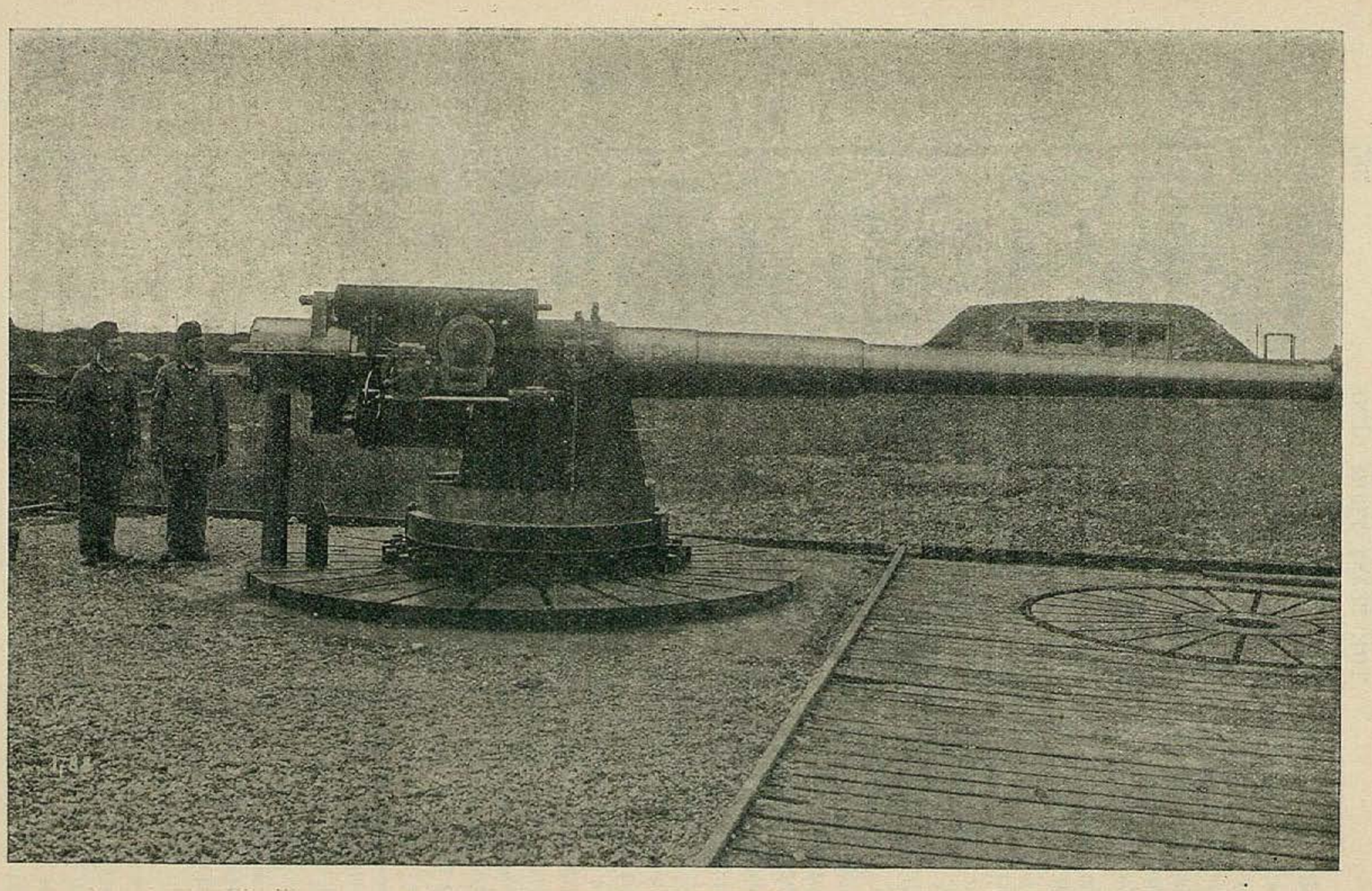


Fig. X.—50-cal. Schneider-Canet 6-inch Quick-Firing Gun.

Limits to length of guns.

The principal factors limiting the length of guns are (*a*) the risk of bending, including the question of girder strength generally; (*b*) the difficulty of forging tubes of the required length; (*c*) the difficulty of housing long broadside guns; (*d*) the difficulty and weight involved in providing armour to protect the breech and loading gear; (*e*) the extra length of ramming and the difficulty in handling the cartridge; and, finally (*f*), the fact that the gas for filling the long bore at a high pressure has all to be evolved in the chamber, and the continuous rush of gas at a high pressure rapidly wears away the entrance of the bore.

With regard to (*a*) and (*b*) the steel manufacturers are yearly attaining more skill in the forging of large masses of steel and in building them up into guns, and it does not seem that these considerations will prevent the lengthening of guns to 60 cals. if found desirable. (*c*) May in great measure be neglected owing to the substitution of guns on deck in turrets for broadside guns. (*d*) Is more serious. In the photograph, Fig. X., of the Canet 50-cal. gun it is perfectly evident that as the length of the gun from balancing point to breech increases, the weight of armour increases at a very rapid rate. Moreover (*e*) the chamber and cartridge become so long that the loading is very difficult. (*f*) The erosion difficulty is also a serious one, and though a long gun need not necessarily have a larger charge than a shorter one, if it does not do so it will not be found to be so well worth its weight.

Shape of the latest type guns.

In order to withstand the high forward pressures, consequent on the use of slow burning propellants, modern guns are nearly cylindrical for at least 20 cals. from the breech.

We give a sketch, Fig. XI., of a 50-cal. British gun, the Vickers 7·5-in., and also of a 50-cal. French gun, Fig. X., the Schneider-Canet 15-c.m. Neither of these guns has been accepted as they stand by their respective Governments, but they are excellent representatives of the type of gun which is being constructed on each side of the Channel. The essential difference in the two guns is that the French gun uses a metallic case, whilst the British gun has a chamber choked in at the rear and relies on a De Bange obturator. The Schneider-Canet cartridge case, notwithstanding its large size, and though nearly 4 ft. long for the 6-in. gun, gives a chamber space about 25 per cent. smaller than that of a gun of the British type. On the other hand the ease of working the breech will undoubtedly be greater with the cartridge case. Still, when it is remembered that, starting with the gun loaded, the 7·5-in. has fired five aimed rounds in 31 seconds, or at the rate of eight rounds a minute, there is every

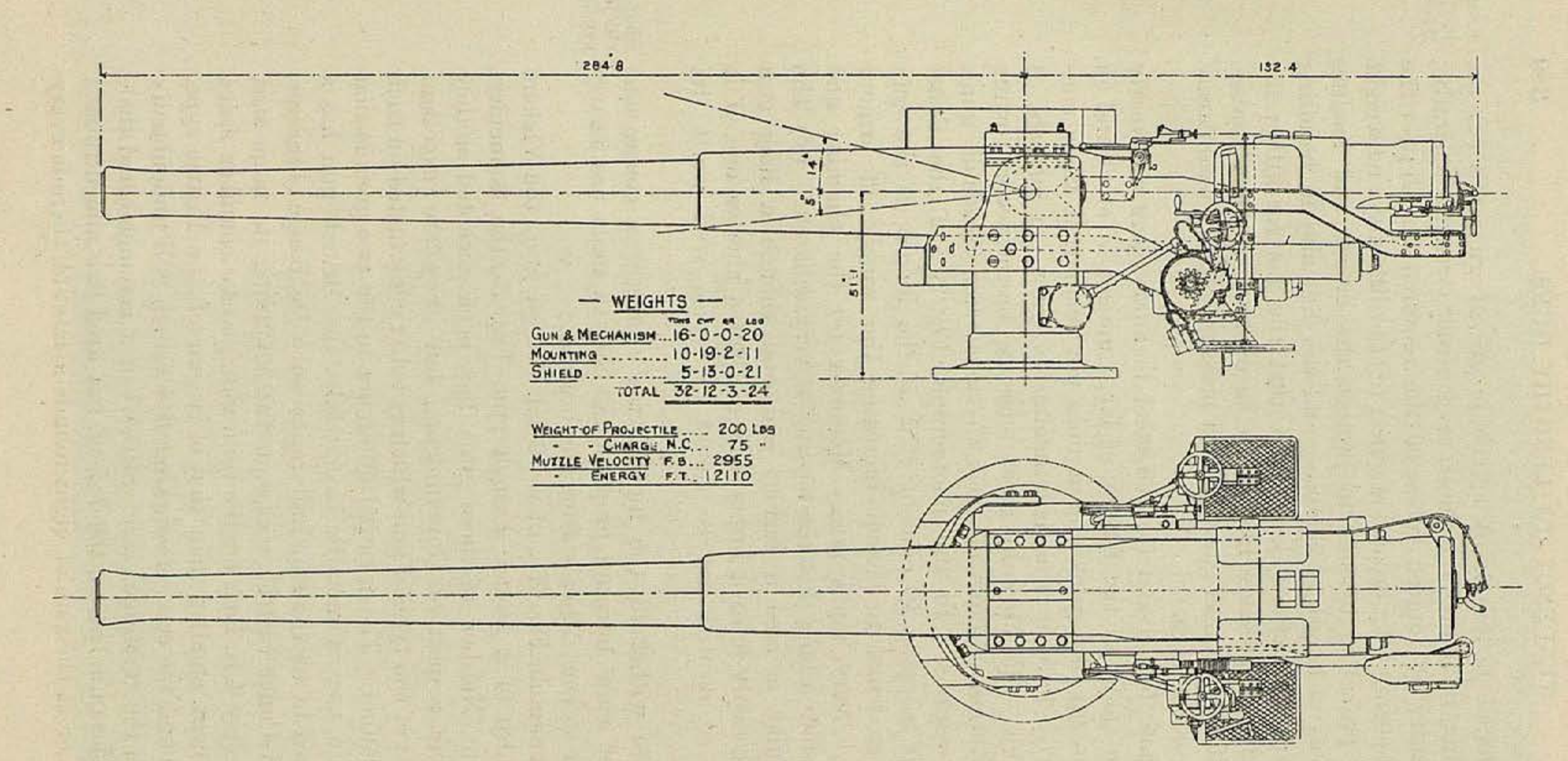


Fig. XI.—Vickers 50-cal. 7·5-inch Gun on Pedestal Mounting as for Libertad.
Muzzle Velocity, 2955 f.s.

reason to accept the De Bange obturator as giving ample ease of working, provided the pad and discs are thoroughly serviceable.

The Vickers firm have lately devised a pad with split rings, which obviates the tendency to expand under pressure, which has caused a good deal of trouble, and occasionally makes it difficult to close the breech. With this improved type of pad the difficulty should disappear, and once this difficulty is surmounted there is every reason to be satisfied with the type of breech action which has been adopted both in Great Britain and the United States.

High power gun designed by Vickers.

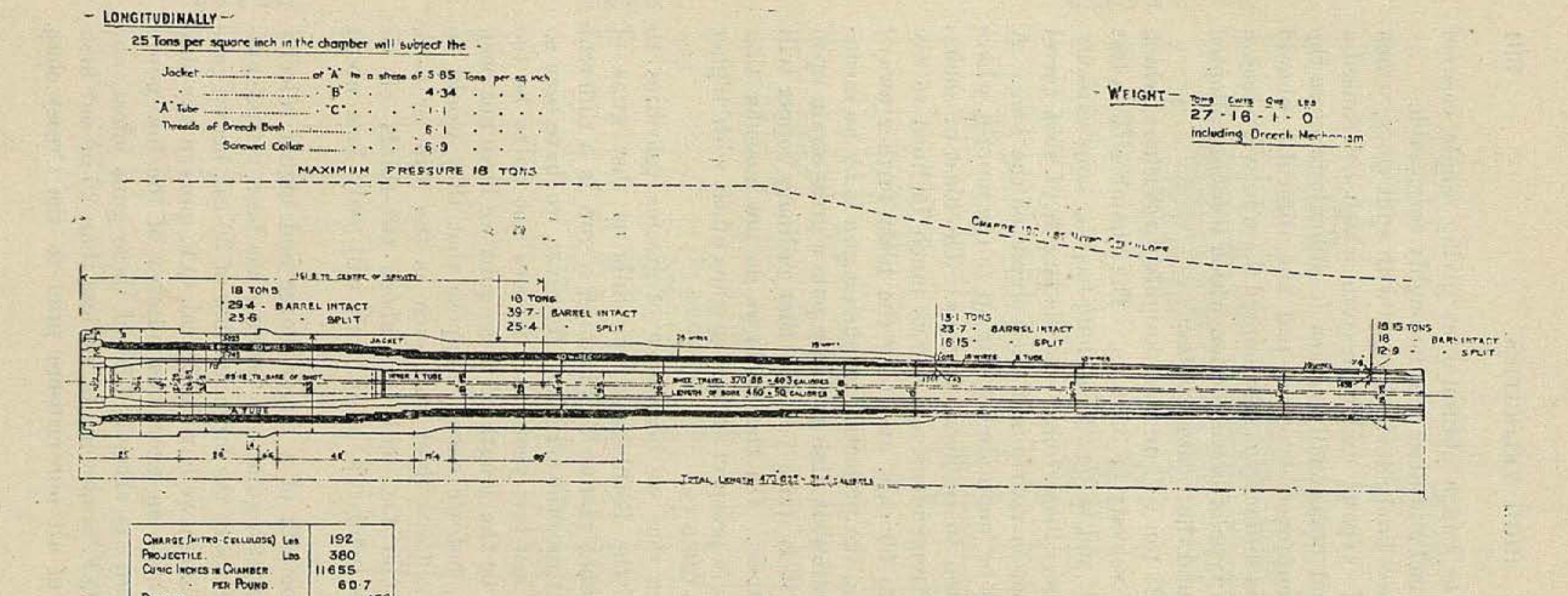
Fig. XII. shows a 28-ton 9·2-in. gun, designed by Vickers, which it is hoped will give a velocity of 3209 f.s. The chamber is no less than 14 in. in diameter, and being 9½ cal. long has the same capacity as a portion of the bore, 19 cal. long. As the length of shot travel is 40½ cals., the chamber is nearly half the volume of the bore. A high pressure will thus be maintained right up to the muzzle, where the pressure is estimated to be about 10 tons. The blast of such a gun will naturally be tremendous, and one is much inclined to say why not lengthen it to 60 cals. and take the blast further away? The question of rotating the projectile in such a gun is by no means a simple one. The continuous high pressure puts a great strain upon the driving band, and it is quite possible that ordinary copper will not stand the heavy stress. On the whole we do not consider that there is much immediate prospect of having guns afloat with higher velocities than 2800 to 2900 f.s.

High velocities aimed at in the U.S.

It is from America that we hear most of greater velocities to come. Mr. Meigs, of the Bethlehem firm, tells us that guns of 3500 to 4000 f.s. are being planned. Planning a gun is a different matter to introducing it into the service. However, we have seen so much advance in the last few years that it does not do to be too sceptical. What is to be the length of these guns we have not been told, nor their calibre, but we should suppose that they would be rather heavy than light, for a light gun, such as the 5-in. or 6-in. with a velocity of 3000 f.s., will lose about two-thirds of its energy at 3000 yards, whilst a 12-in. gun will only lose about one-third.

Increasing the velocity of old pattern guns.

There has been some talk of a larger charge and higher velocity for some of the older British guns, but nothing has been yet promulgated. We mentioned above the large number of 30-cal. heavy guns in our battleships. Though we have no 30 cal. Q.F. guns in any ship not 15 years old, we have an enormous number of the low power 40-cal. 6-in Q.F. There are actually 780 of these guns afloat, and they form the main Q.F. armament of no less than 26 of our first-class battleships, and of all our cruisers prior to the Cressy class.



Charge (Nitro-Cellulose) Lbs	192
Projectile. Lbs	380
Cubic Inches in Chamber	11655
per Pound	60·7
Density	·456
Total Cubic Inches in Bore	38815
Volumes of Expansion	6·915
Muzzle Velocity (Ft per Sec)	3209
Energy (Ft Tons)	26754

* Equals capacity of a portion of the bore 19 calibres long.

FIG. XII.—DESIGN FOR 50-CAL. 9·2-INCH VICKERS WIRE GUN TO GIVE 3209 F.S. VELOCITY WITH GREATLY ENLARGED CHAMBER.

Their velocity is very low as compared to that of all foreign Q.F. guns.

Nation.	Gun.				Muzzle Velocity for a 100 lb. 6-in. Shell or a Similar Projectile.
	Calibre.	Length.	Weight.	Date.	
	in.	cal.	tons.		f. s.
British	6	40	6·6	1891	2180
French	6·5	45	8·1	1893	2540
German	5·9	40	(6·4)* 5·4	1896	2490?
Russian	6	45	5 7	1895	2550 (about)
United States	6	41	6·1	1896	†2150 or 2400 (about)

* Weight of similar gun of 6″ calibre.
† With brown powder. Velocity with smokeless powder about 2400 f. s.

Seeing that the British gun is well up to the weight of its foreign rivals, and the hoops are carried well forward, there seems no reason why the chamber should not be enlarged and the velocity increased to 2400–2500 f.s. Such an increase would give it the same penetration at 3000 yds. as it now has at 2000 yds., namely, 9·8 ins. wrought iron, 7·5 ins. steel or compound, and about $4\frac{1}{4}$ ins. Krupp steel. This would enable it to pierce the armour protecting the Q.F. guns of some few ships which is now impenetrable, and would increase the chance of hitting considerably, so that five of the converted guns would be as formidable as six, or even seven, of the existing ones. Thus, though the gain would be material, the gun can never become an efficient armour piercer, and the rate of fire would remain the same.

10-in. B.L. guns for the Libertad and Constitucion.

Fig. XIII. shows the method of mounting the 45-cal. 10-in. gun in the Chilian battleships. This gun will be the first 45-cal. gun to be installed as the main armament of a British built battleship. It is an excellent gun of its kind, but a 10-in. gun is not sufficient for dealing with such ships as the République, Borodino, or Connecticut. It cannot be expected that the velocity of 2840 f.s., which is claimed for it, will be realised in a somewhat worn gun in cold weather. The gun can deal satisfactorily enough with the 10-in. plating of the Braunschweig and all earlier German ships, the Pobieda, or Vittorio Emanuele, but a 12-in. plate is just proof at 3000 yds., and there is no margin for wear of gun, oblique impact, etc.

The mounting is an admirable one as regards economy of weight, the diameter of the barbette being only 23 ft. The port plate is sloped back 20 degrees. We should have preferred 30 degrees or 35 degrees, so as to give no chance to capped shot. The thickness

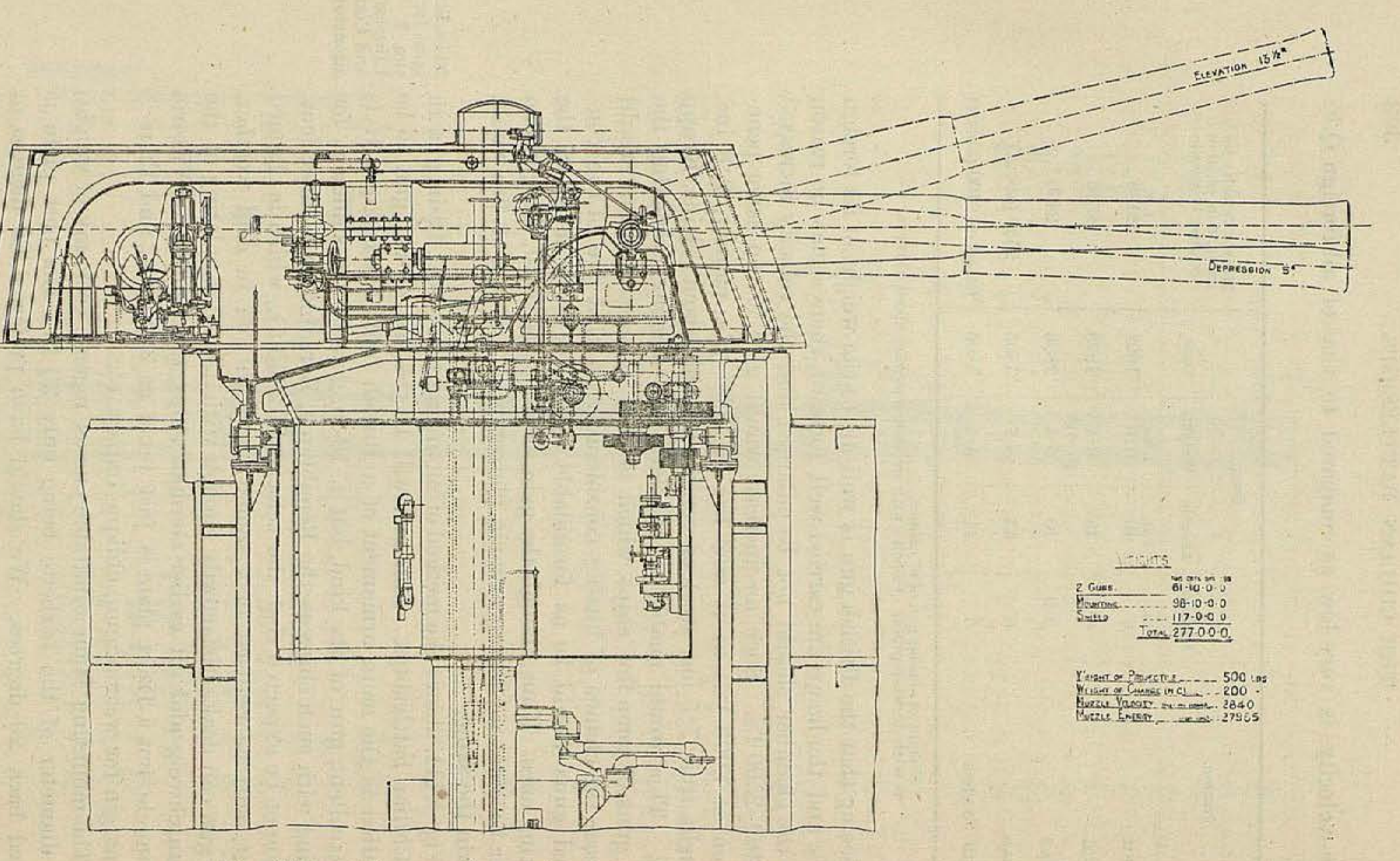


FIG. XIII.—45-CALIBRE 10-INCH GUN AND MOUNTING FOR CHILIAN BATTLESHIP LIBERTAD.

of 9 ins. in the Libertad and 10 ins. in the Constitucion is scarcely adequate if the ship closes in to 2500 yds. or less, in order to give the 10-in. guns a fair chance against any of the big battleships now building. The loading arrangements give every promise of a rapid rate of fire. The Elswick firm speak of three rounds per gun per minute, whilst Vickers is more modest and mentions two. If the turret only gives three rounds per minute from the pair of guns, it will still have a higher rate of fire than any that we know of, and four rounds per minute would put it far ahead of all rivals. The ammunition comes up direct from below to the outside of each gun carriage, and is transferred to a parallel motion loading tray, similar to that which has proved so satisfactory for the 9·2-in. A hydraulic chain rammer is used, and a ready supply of projectiles for hand loading is placed in rear of each gun. Hydraulic gear is used for training, elevating, and loading; the loading is carried out at any elevation between 5 degrees elevation and 3 degrees depression. In the Elswick mounting the breech screws are worked by hydraulic power, in the Vickers design they are worked by hand.

The sketch, Fig. XIII., shows the sighting gear fitted with Grubb sight. Everything is within the armour, and the protection is excellent. The front of the hood might with advantage have been made somewhat thicker. The total weights are given in the sketch. It will be noticed that the mountings and shield are considerably more than three times as heavy as the guns. The weight of the barbette is not given, but it is probably quite as heavy as the moving parts, so that the guns are only about one-eighth the weight of the whole. An increase in the weight of the guns would not increase the other weights *pro rata*, and we should much prefer to make the ship big enough to carry 12-in. guns.

If the gun lately proved at Sandy Hook is not the biggest gun existing, it has an excellent claim to have the greatest energy. Yet so little is the interest now taken in the very big guns that the proof of this gun has scarcely been noticed in the public Press. The gun in question is the 16-in. U.S. army gun, weighs 126 tons, and is 59 ft. long, with a bore of 42 cals. It uses a very heavy projectile for its calibre, namely, 2300 lbs. With a charge of 640 lbs. nitro cellulose, and a pressure of 17·2 tons, it attained a muzzle velocity of 2306 f. s., corresponding to a muzzle energy of 84,880 f. t., as against 54,500 f. t. for the British 16·25-in. gun. With an ordinary projectile of the British type, which would weigh 2000 lbs., the muzzle velocity would be 2470 f. s., which is almost exactly the velocity of the 12-in. British gun of 40 cals. The penetration can only be guessed, because there is absolutely no experience of firing at the type of plate required

The biggest gun in the world.

to resist such a gun. It may be estimated at somewhere about 20 in. of Krupp steel at 3000 yards, always supposing that such a plate could be produced. There would be no need in a gun of this power to use armour-piercing shot. An armour-piercing shell, with a bursting charge of 100 lb. to 120 lb., would readily pierce the thickest existing armour at 5000 to 6000 yds. range. But for the same money it would be easy to mount, equip, and man two 12-in. guns, which would have ample power, and would probably fire four rounds to one of the 16-in. So that the gun is not likely to be repeated.

Medium and light Q.F. guns with automatic breech actions.

Semi-automatic guns, in which the breech opens automatically on counter recoil, have been adopted in the U.S. for use against torpedo craft, etc., and a 3-pr. automatic gun has been brought out by Vickers. In this gun the hopper has to be kept fed with cartridges, whilst in the semi-automatic gun they are sent home into the chamber. There is no evidence as to the rapidity of firing for any considerable period, much less as to rapidity of hitting. But since the difficulty with light Q.F. guns is rather to lay quickly than to load at a great speed, it has yet to be shown that there is sufficient advantage to countervail the increased complication. In such trials as have taken place in England the ordinary non-automatic gun has held its own well against the semi-automatic type. The Bethlehem Company has recently completed a 5-in. gun in which the breech is opened automatically on counter recoil, and the breech can be closed from a position clear of the recoil. We have often seen small guns, such as the 12-pr., throw the breech open on counter recoil, owing to the inertia of the closing lever. We do not consider much time is gained by an arrangement which does this, nor does the act of springing clear of recoil after closing the breech take more than half a second, so that at the outside we should not expect a gain in time of more than a second a round for loading the 5-in., and we doubt if this is worth the extra complication. As Captain Percy Scott has demonstrated by his loading machine, the great point in a Q.F. gun of any size is to get the shell and cartridge home quickly; the breech works rapidly enough as it is.

Armoured gun.

The Bethlehem Company have also experimented with a gun which has an armoured V shaped shield secured to the fore part of the cradle. Thus the gun's crew may be pretty thoroughly protected from the effect of a shell hitting the large embrasure port inseparable from a casemate or box battery. The shield is of 3-in. hardened steel. It was fired at direct by a 13-pr., with velocity 1936 f. s. and piercing power 6·8-in. wrought iron., which gives the good figure of merit of 2·25. The shot broke up, and did not penetrate. A 50-lb. 5 in. capped shot striking at 47° to the normal, velocity 1855 f.s.,

and piercing power 9·6 in. wrought iron (for direct impact), went through and did some damage inside. As the inclination of the plate should have reduced the piercing power of this shot to about 6¼-in. wrought iron it did well to pierce. It is only another example of the fact that obliquity of impact does not assist face-hardened plates as much as it does softer plates or in other words the face-hardened plate is at its best as compared with other plates when resisting direct impact. The structure was entirely unharmed by the attack, and the device may have a future before it if a thickened shield can be made to resist the (oblique) attack of the 6-in. gun. For this purpose the thickness would have to be about 4½-in. and

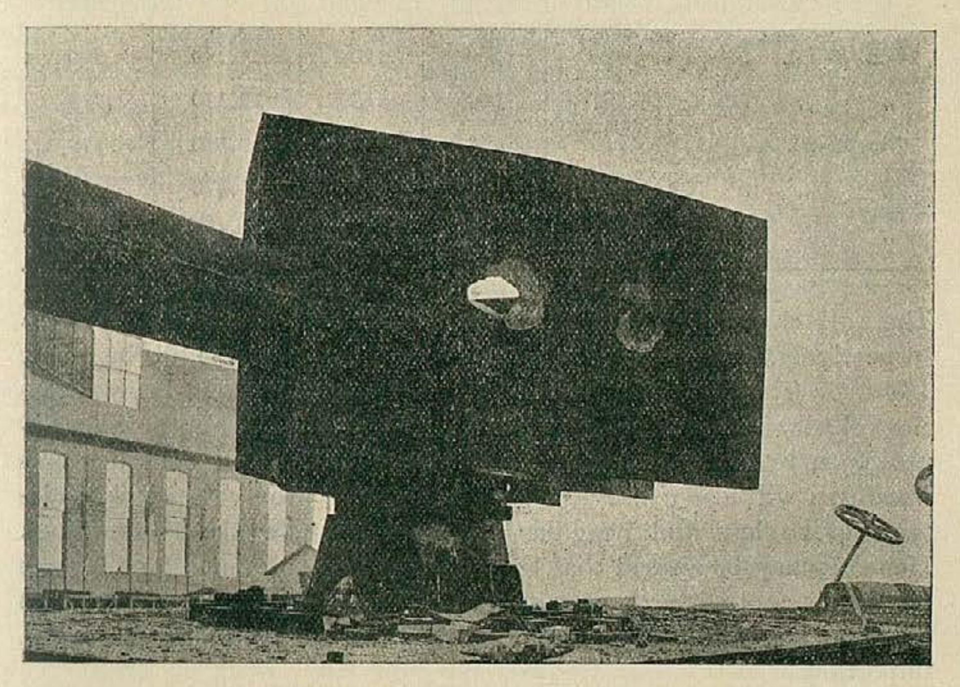


FIG. XIV.—BETHLEHEM STEEL COMPANY.

Armoured 6-inch gun with V shaped shield (left side), showing hole made by 5-inch shot, also ineffective impact of 13-pdr.

the weight some 4 tons, rather a serious addition to the weight of gun and cradle, which is now some 9 tons, but not excessive for fairly quick hand laying. But the 6-in. gun being well nigh outclassed, the question is whether such a shield could be applied to the 7-in. or 7·5-in., and the extra weight would then become more serious still, and the value very problematical.

Improvements in propellants.

There is little progress to report as to the adoption of new propellants, nor is there any fresh record as to very high velocities. The United States, Russia and France all use nitro-cellulose powder,

whilst Great Britain, Germany and Italy still retain the nitro-glycerine compounds, of which cordite is the type. There is no doubt that very high velocities can be obtained with large charges of nitro-cellulose, but we have no sufficient evidence that the velocity will be regular under Service conditions, or that the keeping qualities will be as good as with cordite. We noticed last year that the United States nitro-cellulose gives low and irregular velocities with reduced charges. Here is another instance, giving the performance of moderate charges of this propellant :—

Gun Nature.	Charge Weight.	Projectile Weight.	Muzzle Velocity.	Energy.	Energy per lb. of powder.
	lbs.	lbs.	f. s.	f. t.	f. t.
10-in. 40 cal. . .	106	500	1794	11,180	105
,, ,, . .	107	500	1869	12,140	113
12-in. 40 cal. . .	215	866	1610	15,590	73
,, ,, . .	215	868	1653	16,470	77
,, ,, . .	230	867	1745	18,400	80

The full charges for the guns in question are 240 lbs. and 350 lbs. respectively, and the energy per lb. of powder should be about 130 f. t. The fact that the energy falls so low in the 12-in., and that the velocity varies so much in the 10-in., shows that the powder will not burn regularly when the pressure is low. But a cold day or a worn gun will also cause low pressures, so that the velocity will also tend to be low and irregular when fired under these conditions. Hence it may be argued that the results are not promising as regards regularity, and without regularity there can be no good shooting at long ranges, and long range fire is becoming more and more important.

M.D. cordite.

No results have been published as to the velocity obtainable with modified (M.D.) cordite. Nor would they give information as to erosion if the velocity was known. Both cordite and M.D. cordite will undoubtedly give 2800 f.s. in a 45-cal. gun, but we know that with cordite the erosion is excessive. We also know that for the same velocity the erosion caused by a nitro-cellulose charge is much less, and that M.D. cordite to some extent strikes the mean. But of the relative endurance of the rifling of a gun when using one or other of these propellants nothing has been divulged. It must not be forgotten that it is mainly the rifling that is attacked by erosion, and that it is only the inner tube that needs renewal when the so-called "life" of the gun runs out. If an erosive charge be used

it is necessary to have a large reserve of guns, whereas with a non-eroding powder the reserve may be reduced without undue risk.

But the nitro-cellulose powder is so expensive that a charge made up from this propellant will cost about twice as much as a cordite charge. If the money thus saved be expended in reserve guns and in plant for quickly relining those that are much worn, there does not seem any great advantage in adopting a charge which from its bulk is more difficult to handle than a cordite charge, entails larger magazines, and takes up more space in ammunition lifts and loading gear, besides requiring special refrigerating plant to keep it cool in hot weather.

Progress in rate of firing and rate of hitting.

Ten years ago the man in the street knew absolutely nothing about practice with naval guns. Indeed, he had no means of learning anything on the subject. At present, the daily and weekly papers, to say nothing of the monthly magazines, are full of reports and comments on the results of prize firing and other competitions. Such publicity was never intended, but seems inevitable when a large number of men are deeply interested, and when a warm spirit of emulation has sprung up between ships and squadrons. And there can be no doubt that the publicity of recent years has been contemporaneous with a marked improvement in the practice. Twenty years ago no one knew or cared whether a ship shot well or ill, there was no record to refer to, and no means whatever of making a comparison between ships. Now and again a ship might shoot well and take an interest in the practice, but each ship went away by herself to fire, as if it was something to be ashamed of, or at any rate to be got through in private. Not much more than ten years ago it was not unusual for flag officers to go ashore to get out of the firing, and if the gunnery lieutenant worried himself in the matter, it was looked upon as part of the eccentric behaviour natural to a man cranky on guns. All this has changed now. The flag officers not only pay close attention to the practice, but new methods are constantly devised under their direction, in nearly all of which there is more supervision exercised over a ship's firing, the Commander-in-Chief very commonly going on board the ship that is practising, or placing his flagship so as to be in a position to judge of the accuracy, rapidity, and general efficiency of the fire. In the Mediterranean as well as in China, the Commander-in-Chief has presented a challenge trophy to the ship making the best practice. The China trophy is for prize firing, but in the Mediterranean the cup is given for a special competition in which all the guns of the ship fire together. The conditions of this latter practice have not been published, but it is carried out at a long range and seems sometimes to be styled

"long range firing." What this range is has not been stated, but practice has certainly taken place up to 4000 and 5000 yards range in some of the preliminary exercises that took place previous to settling the details of the new practice. It is distinctly more practical that all the guns should fire together at an unknown range, rather than that each gun should fire separately at a known distance; but the second leads up to the first and is the best test of the skill of the man behind the gun. It is necessary first to train the gunners, secondly to control and direct the practice, which becomes most important when all guns fire together.

Prize firing.

In prize firing the range is known and is marked by buoys, whilst the ship steams past the target at a predetermined speed. The guns fire singly as under:—

For 12 *minutes*: 16·25-in.; 13·5-in.; 12-in. VII. (old pattern); 10-in.; 9·2-in. VII. (old pattern); 8-in.
For 6 *minutes*: 12-in. VIII. and IX.; 9·2-in. VIII. and X.; 5-in.; 4-in.
For 2 *minutes*: 6-in. VII.; 6-in. Q.F.; 6-in. Q.F.C.; 4·7 Q.F.; 4-in. Q.F.

The time allowed to each type of gun is arranged so that the number of rounds per gun should be between five and twelve, the old-fashioned slow-firing guns getting six times as long as the Q.F.; yet even so, it is one of the latter that does twelve rounds, and one of the former, five. In every case the firing is divided between two men, so that the number of rounds per man varies from two to six. The handing over the laying of the gun to an understudy in the middle of a series of rapid firing greatly increases the difficulty. It is common enough that No. 1, who fires first, has just got fairly on the spot when he is succeeded by No. 2. All rifle shots will realise that two or three rounds may well be expended, even by a good shot, in getting on to the target, and in prize firing it may be said that from 20 to 40 per cent. of the rounds fired are really trial shots. This is felt most with the heavier guns, for which the number of rounds fired is fewest, besides which there is a great variation of the range for these guns, viz., from 1400 to 1940 yds., whilst with the Q.F. guns the range always lies between 1400 and 1500 yds. Moreover, there being far more Q.F. guns in a ship than heavy guns, most of the latter get much benefit from their predecessors' experience and are able to correct their sights more accurately from the errors of the day. From these considerations it follows that the Q.F. guns tend to shoot better and more consistently than the heavy guns. Chance exercises more influence on heavy gun firing than on that of the lighter pieces.

Size of target.

In order to equalise matters somewhat for the heavy guns they fire at a much larger target. All the Q.F. guns have a target 15 ft.

high and 20 ft. broad, more than twice the size of a casemate. For the heavy guns and indeed for all guns allowed six or twelve minutes, two triangular wings, each 15 ft. high and 16 ft. along the foot, are attached to the Q.F. target. This makes the foot of the target 52 ft. in breadth, and increases the total area from 300 to 540 sq. ft. About one-third of the hits made by heavy guns are on the wings. Thus 45 per cent. of hits from a heavy gun would only be equivalent to 30 per cent. from a Q.F. As pointed out last year, an average-sized barbette for a heavy gun with that part of the belt which protects its lower portion is a larger target, and distinctly easier to hit than the prize-firing target; the size of the latter is, therefore, by no means excessive. Although there is a wide difference in the speed of the ship for the slow and quick-firing guns respectively, viz., 8 knots for the former and 12 knots for the latter, the effect on the accuracy is not very marked, as it is pretty easy to hit at 12 knots, and a reduction of the speed to 8 knots would not increase the number of Q.F. hits to nearly the same extent as the reduction of the range for heavy guns to 1400 to 1500 yds. would increase theirs. On the whole, the conditions of firing favour the heavy guns in the proportion of about four to three, as compared with their Q.F. rivals, but this makes no allowance for the greater number of "trial shots" inevitably wasted by the heavy guns, nor for the greater difficulty of laying. It is necessary to take all these facts into consideration before any comments are made on the percentage of hits.

Prize firing for 1901 and the *Times* comment thereon.

The *Times* published a long analysis of the results of prize firing in 1901, and, after pointing out appositely enough that the accuracy varied very considerably in different ships, summed up by remarking that naval gunnery had progressed but little in the previous three years, in support of which statement the following table was adduced:—

TABLE PUBLISHED BY THE "TIMES."—HITS PER GUN PER MINUTE.

——	1899	1900	1901	No. of Guns that fired.
16·25-in. and 13·5-in.	·14	·12	·16	48
12-in. Mark VIII.	·28	·30	·33	48
12-in. Mark I. to VII.	·13	·10	·12	8
10-in. B.L.	·26	·39	·35	17
9·2-in. Mark VIII.	—	·75	1·16	2
9·2-in. (less than Mark VIII. and 8-in.)	·23	·20	·28	31
6-in. Q.F.	1·05	1·51	1·81	405
6-in. Q.F.C.	·85	·66	·78	167
5-in. and 4-in. B.L.	·43	·50	·34	94
4·7-in. and 4-in. Q.F.	1·86	1·60	1·93	322

It is quite true that at the first glance the improvement does not appear very marked, but the *Times* has quite forgotten to consider the number of guns represented by each line of the table, so we have added a column showing the actual number. From this it will be seen that there is a phenomenal improvement in the shooting of the 6-in. Q.F. guns, which are not only the most numerous, but are also the most important of the Q.F.'s. Again, the most numerous and most important of the heavy guns, the 13·5-in. and 12-in. VIII., have increased their hits by some 18 per cent, and at the bottom of the table the 4·7-in. and 4-in. have also made a decided improvement. This would be more evident if the 4·7 had been separated from the 4-in., when it would have been seen that the figure for the former gun had improved from 1·95 in 1899 to 2·27 in 1901. The 4-in. is a small ship's gun, and owing to the motion of such vessel is not as accurate as the 4·7-in.

As for the 6-in. Q.F.C., and the old 4-in. and 5-in. B.L., these guns are only to be found in the obsolescent ships, where doubtless the diligence and zeal is scarcely up to the mark of three years ago, when many of the ships now relegated to guard-ship work were on important foreign stations, and though these guns ought to do much better than they do still they are in no way representative of the service in general. If we consider the advance made by the important guns in the last six years it is most notable and satisfactory.

HITS PER GUN PER MINUTE.

	1897	1898	1899	1900	1901	1902
13·5-in. .	·08	·14	·15	·13	·17	—
12-in. VIII. .	—	·28	·28	·30	·33	·39
6-in. Q.F. .	·90	1·10	1·05	1·51	1·81	2·18
4·7-in. Q.F. .	1·71	1·78	1·95	—	2·27	—

It is doubtless a fact that in 1897 the shooting was not up to the mark, but when we find that the efficiency of the important 6-in. gun has doubled, and that there is a gain of more than 50 per cent. all round, it is perfectly clear that the depreciatory remarks of the *Times* are not well founded.

The following table illustrates the relative value of various guns as shell guns, taken from the results of the years 1900–01–02 :—

WEIGHT OF METAL HITTING PER MINUTE FROM A SINGLE GUN.

Gun.	Weight of Hits per Minute.		
	lbs.		
13·5-in	188	Target 540 sq. ft. Range 1400 to 1900	8 knots.
12-in. VIII. and IX. . . .	289		
9·2-in. X.	327		
6-in, Q.F.	183	Target 300 sq. ft. Range 1400 to 1500	12 knots.
4·7-in. Q.F..	102		

The inferiority of the 13·5-in. gun is only too evident. The 9·2-in. gun is much less than half the weight of the 13·5-in., but gets in 60 per cent. greater weight of metal, whilst the penetration of Krupp steel by the heavier gun only exceeds that of the lighter gun by a bare inch at 3000 yds., and the advantage at shorter ranges is less still. Three 4·7's, weighing 6½ tons, will put in a greater weight of metal than the 50 ton 12-in. Again, the 6-in. Q.F., which is one-tenth the weight of the 13·5-in., will put in the same weight of metal in the same time; in fact, as long as the target is unarmoured and all projectiles pierce alike, the heavier guns do not compare with the Q.F.'s. The merit of the heavy gun is mainly based on its power of smashing in armour. If it fails in this respect it is not worth its weight. The big gun, in fact, should always be loaded with a projectile capable of piercing the ship or part of the ship fired at. A common shell has no business in such a gun if it is liable to be stopped by armour, unless, indeed, the armour-piercing shot or shell is equally powerless.

The new 9·2-in. guns as a secondary weapon for battleships.

The new 9·2-in. comes out very well. One of these guns can put in about twice the weight of metal of the 6-in. in a given time and as its piercing power is double that of the 6-in. it will be thoroughly effective when the latter fails. For a battleship we should consider one 9·2-in. more than equal to four 6-in., and the weight of guns and armouring would be much greater in the latter case. It is quite possible to have six 9·2-in. on one broadside by putting them in pairs in turrets. These twin guns would probably fire slower than the single guns referred to above, but they would be decidedly more formidable than eighteen 6-in., and if it is desired to bring this number to bear, two or three existing battleships would

have to concentrate their broadsides. And no concentration of fire will make a 6-in. effective against even 5-in. armour.

We much regret that no 7·5-in. gun is yet mounted. Believing as we do that this is essentially the gun for the smaller sized armoured cruiser, it is a great pity that its introduction has been so long delayed. Six-inch guns still figure largely in the Estimates, and yet it is absolutely certain that this gun has been put quite out of court by the armouring of the ships now coming forward.

The best results obtained at prize firing.

The names of certain ships have come forward prominently as excelling in the number of hits made at prize firing. It does not necessarily follow that these ships are the best shooting ships in the Service, because it is possible that there were others which might have beaten them if weather, etc., had not been against them. Thus the Terrible fired in somewhat unsatisfactory weather and did not come out well. But the ships named below were so remarkably good that their scores will be very difficult to beat, and they have all established one new record, and the Ocean two.

Ship.	Heavy Guns.					Q.F. Guns.					Remarks.
	Nature.	No. of Rounds.	No. of Hits.	Rds. per Gun per minute.	Hits per gun per minute.	Nature.	No. of Rounds.	No. of Hits.	Rds. per Gun per Minute.	Hits per Gun per Minute.	
Ocean .	4 12" VIII.	25	17	1·04	·71	12 6"	163	117	6·8	4·87	
Crescent .	1 9·2" VI.	10	9	0·83	·75	12 6"	139	105	5·8	4·37	9·2" was a Mark III. mounting; 6" had 3 motion mechanism.
Hood .	4 13.5"	34	20	0·70	·42	10 6"	105	81	5·25	4·02	

The Ocean gained her pre-eminence by firing at a very rapid rate with her 6-in. guns, and also by getting a very high percentage of hits, both with the 6-in. and 12-in. The 6-in. guns fired at the rate of 6·8 rounds a minute, which is almost phenomenal. We believe no other ship has attained 6 rounds a minute, and the average is only just over 4. The greatest number of hits previously made with twelve 6-in. guns was the Terrible's 103 at the rate of 4·3 rounds per minute, and the Ocean has now done 4·87, or 12 per cent. better. With the 12-in. guns the Ocean had her own record of fourteen hits to beat, which she succeeded in doing by raising the record to seventeen. The rate of fire of the 12-in. was not very remarkable, and there seems scope for improvement here, but the 6-in. score will take a great deal of beating.

The Crescent established a record with her single 9·2-in gun by getting nine hits in twelve minutes, and she also beat the Terrible's 6-in. Q.F. record of 103 hits, in 1901, by getting 105 hits from her twelve 6-in. guns.

The Hood greatly distinguished herself by averaging five hits in twelve minutes from each 13·5-in. gun, the best result hitherto obtained being only 3·5 hits in the same time. This excellent score was in measure due to the engineer who worked the hydraulic loading gear, for he made it run at a higher speed than had ever before been reached. Thus the Hood fired 34 rounds, whereas the greatest number hitherto fired by any ship with 13·5 guns has been 28. The Mars scored a record, as regards rate of firing, by getting off 32 rounds from four 12-in. guns in six minutes, but she only made ten hits. The Hood's 6-in. gun firing has only been beaten by Ocean, Crescent, and Terrible, her figure of four hits per minute being much in advance of the Astræa, which stands fifth, having scored 3·5 in 1901.

The Barfleur's record of 5·7 hits per minute from the 4·7-in. gun, made in 1901, does not seem likely to be beaten. This gun is now used in the smaller classes of second-class cruisers only, where the conditions of firing are scarcely as favourable as in a battleship. Although the improvement in firing has been great, there is still scope for further advance. There are a number of ships that have not reached half the average figure of merit; all these may well be expected to do better. The best recorded results are not likely to be greatly improved upon, but the number of poor performances should be materially reduced.

We have not dwelt much on the percentage of hits to rounds fired because we consider that a ship that gets, say, 60 hits out of 100 rounds from her 6-in. guns with a percentage of 60 is inferior to a ship that gets 60 hits from 120 rounds with a percentage of 50, but if the percentage is considered the main thing the former is considered the best. The fast shooting ship will score more than the other directly the target becomes larger, or the range becomes shorter; moreover, it is generally easier to increase the proportion of hits than it is to increase the rate of fire. An undue anxiety to score a high percentage of hits leads to a pottering style of shooting. Both the Crescent and Hood beat the Ocean in percentage of hits, but the latter is decidedly the best ship. Generally the ships that fire fastest have a good percentage of hits, but this is not invariably the case. Thus in 1901 the Canopus stood first in rapidity of fire with the 6-in. Q.F., but her percentage of hits was so low (27) that she was beaten by 26 other ships in rapidity of hitting. On the other hand, the Terrible and Astræa,

Percentage of hits.

which were second and third in rapidity, were first and third in hitting.

Rate of fire and rate of hitting of French Northern Fleet.

There is very little information to hand on the subject of what is being done abroad as regards rate of hitting, but such accounts as have appeared seem to show that it is not remarkable.

On May 15 the French Northern Fleet fired at the old gunboat Surcouf. Length, 161 ft.; breadth, 26 ft.; freeboard, 12 ft.

Ship.	Guns on Broadside.		Guns Ahead.		Rounds fired.	Hits.
Formidable	1 14·5-in.	2 6·5-in. Q.F. 4 5·5-in. Q.F.	1 14·5-in.	2 6-in. Q.F. 1 5·5-in. Q.F.	74	12
Courbet	2 13·5-in. 2 9·4-in.	5 5·5-in. Q.F.	1 13·5-in. 2 9·4-in.		57	3
Amiral Tréhouart	2 12-in.	4 4-in. Q.F.	1 12-in.	2 4-in. Q.F.	63	9
Bouvines	2 12-in.	4 4-in. Q.F.	1 12-in.	2 4-in. Q.F.	48	5
Valmy	2 13·5-in.	2 4-in. Q.F.	1 13·5-in.	2 4-in. Q.F.	18	2
Jemappes	2 13·5-in.	2 4-in. Q.F.	1 13·5-in.	2 4-in. Q.F.	15	5
Dupuy du Lôme	2 7·5-in.	3 6·5-in. Q.F.	1 7·5-in.	2 6·5-in. Q.F.	65	5
	15 heavy guns.	26 Q.F. guns.	9 heavy guns.	13 Q.F. guns.	340	41

It is not said whether the target was or was not brought on the beam, but if we assume that the bearing altered from ahead to abeam the average number of guns bearing would have been twelve heavy guns and twenty Q.F.'s. It is not clear if the practice lasted for twelve or fifteen minutes, but if we take the former, and allow that the Q F. guns fired three times as fast as the heavy guns we get:—

		Rate of Fire.
12 heavy guns fired 4 rounds per minute =	48.	1 round in 3 min.
20 Q.F. guns fired 25 rounds per minute =	292.	1 round in 50 secs.
	340	

Range 4300 to 2400 yards. Hits per minute for 12 minutes, 3·4. Hits per cent., 12.

The range was much longer than that of any British practice of which the records have been published, but it is not said how many rounds were fired at 4300 and how many at 2400. If we take 3500 yards as the mean range, it should have been about three times as difficult to hit the Surcouf as the British prize-firing target, and the number of hits—viz., 12 per cent.—is reasonable enough as compared with 40 per cent. for British prize-firing. But the rate of fire is slow. The Majestic, when firing at the Belleisle (see *Naval Annual* for 1901), fired about three times as fast as the French, and got in about 10 hits per minute, or at thrice the rate of the whole French squadron. The Belleisle was perhaps fifty per cent. larger than the Surcouf, and the range only 1500 yards as compared with

3500. The seven French ships carried about four times as many guns as the Majestic, so that on the whole, and allowing for the different ranges, we should have expected the French squadron to make at least seven hits to the Majestic's ten. They only made 3·4—not a satisfactory result.

Accounts have also been published of firing by the Kearsage, Alabama, and Massachusetts, when the following results were obtained, the average range being 1600 yards:— American heavy gun practice.

	No. of Rounds.	Hits.	Per Cent.	Target.
Alabama	55	15	27	16 ft. × 50 ft.
Kearsage	49	13	26	
Massachusetts . . .	50	3	6	
	154	31	20	

The conditions of firing are not stated, but mention is made of six minutes. Each of these ships has twelve heavy guns, and if they each fired for six minutes the total number of rounds would be about as reported. The number of hits is very poor, about half the average for the British prize firing.

There is ample evidence that the practice in our Navy is improving; this is clearly shown by prize-firing results. The practice which is taking place at long range is decidedly a step in advance. There are no detailed reports as to the results of this practice, but here, too, it is said that a distinct improvement is being made. Such fragmentary reports as have appeared of French and American practice seem to indicate that they cannot claim an equality with us at present. Still, there is ample scope for further improvement, the average results being still a long way below those obtained by the best ships. Summary as to accuracy of fire.

BRITISH RIFLED ORDNANCE.

(Compiled from the official "List of Service Ordnance, 1898," and supplemented by subsequent information.)

Ordnance: Nature: Calibre or Pr.	Nature: Weight.	Nature: Mark and Service.*	Total length in inches.	Length of Bore, including Chamber.	Chamber: Diameter (at largest).	Chamber: Length to base of projectile.	Rifling: Twist one turn in: Least at breech.	Rifling: Twist one turn in: Greatest at muzzle.	System.†	Charge (full): Weight.‡	Charge (cordite): Weight.	Charge (cordite): Size.	Projectile: Diameter.	Projectile: Weight.	Projectile: Bursting Charge of Common Shell.	Projectile: Value of $\frac{d^2}{w}$.	Projectile: Value of $\frac{w}{d^3}$.	Muzzle velocity.	Ballistics (with full charges): Total muzzle energy.	Perforation of wrought iron: At muzzle.	Perforation of wrought iron: At 1000 yards range.	Perforation of wrought iron: At 2000 yards range.	Perforation of wrought iron: At 3000 yards	Perforation Krupp steel, 3 00 yards.
B.L. GUNS.				cals.	ins.	ins.	cals.	cals.		lbs.	lbs. oz.		ins.	lbs.	lbs. oz.			f. s.	ft. tons.	ins.	ins.	ins.	ins.	ins.
16·25-in.	$110\frac{1}{2}$ tons.	I. II. & III.	524·0	30·0	21·125	84·5	Various in the newer patterns.	30	P. Elswick, Hook, or Modified Pl. Section, the last in the new guns.	960 S.B.C.	..	..	16·25	1800	‡‡193 / **$179\frac{1}{4}$	0·147	0·420	2087	54,390	38·0	34·6	31·7	29·4	13
13·5-in.	69 & 67 tons.	I. II. III.& IV.	433·0	30·0	18·0	66·5		30		630 S.B.C.	187 8	..	13·5	1250	**85	0·146	0·508	2016	35,230	33·0	30·2	27·6	25·2	11
12-in.	45 & 46 tons.	III. IV. V. & V.$_w$	328·5	25·25	16·0	48·0		35		295 P.Br.	88 8	30	12·0	714	$31\frac{13}{16}$ / ‡‡95 / **79	0·202	0·413	1914	18,130	24·4	21·5	18·9	16·1	6
12-in.	46 tons.	VIII. Wire	445·5	35·43	16·0	70·0		30		..	167 8	50	12·0	850	$80\text{–}1\frac{3}{11}$	0·169	0·492	2367 / 2481	33,020 / 36,290	37·0 / 39·7	32·7 / 35·4	29·4 / 31·6	26·6 / 28·7	$11\frac{1}{2}$ / $12\frac{1}{2}$
12-in.	50 tons.	IX. Wire	496·5	40·0	17.5	87·2		..		..	201 8 / 9 8	50 / $3\frac{3}{4}$	12·0	850	"			*a*						
10-in.	29 tons.	II. III. III.^{A} & IV.	342·4	32·0	14·0	54·0		30		252 P.Br.	76 0	30	10·0	500	$37\frac{3}{4}$	0·200	0·500	2040	14,430	24·8	21·8	19·3	17·0	$6\frac{3}{4}$
9·2-in.	21 & 22 tons.	I. & II.	255·8	25·56	11·0	44·0		35		140 P.Br.	42 0	30	9·2	380	18 / ‡‡33 / **$30\frac{6}{16}$	0·223	0·488	1781	8,356	18·3	15·9	14·4	12·4	$5\frac{1}{4}$
9·2-in.	24 & 22 tons.	III. V. VI. VI.$_{A\&c}$ & VII.	310·0	31·5	12·0	43·0		30		164 P.Br.	53 8	30	9·2	380		0·223	0·488	2065	10,910	22·9	19·8	17·2	15·5	6
9·2-in.	25 tons.	Wire VIII.	384·0	40·08	10·5	53·15		..		..	63 0	40	9·2	380	..	0·223	0·488	2347	14,520	27·6	23·9	20·7	18·0	$7\frac{1}{4}$
9·2-in	27 tons.	Wire IX.	445·25	46·74	13·0	71·215		..		..	103 0	44	9·2	380	..	0·223	0·488	2640	18,400	33·3	28·9	25·0	22·0	9
8-in.	14 tons.	III.	222·5	25·1	10·5	34·5		35		104 P.Br.	28 12	20	8·0	210	$13\frac{10}{16}$ / ‡‡29 / ‡‡$18\frac{1}{2}$	0·305	0·410	1953	5,554	16·8	13·8	9·5	8·0	$3\frac{1}{2}$
8-in. / 8-in.	15 tons. / 14 tons.	IV. / VI.	254·5	29·61	10·5	38		35 / 30		118 P.Br.	32 10	20	8·0	210		0·305	0·410	2150 / 2200	6,730 / 7,046	19·3 / 20·0	16·0 / 16·6	13·2 / 13·7	10·8 / 11·3	$4\frac{1}{2}$ / $4\frac{3}{4}$
7·5-in.	14 tons.	..	337·5	45	11·1	55		30		..	47 0 / 2 8	30 / $2\frac{1}{2}$	7·5	200	$18\frac{1}{2}$	0·281	0·474	2600	9,340	26·0	22·3	18·8	15·7	6
6-in.§	5 tons.	III.	170·7	25·53	8·0	26·75		35		36 E.X.E. / 48 E.X.E.	14 12	20	6·0	100	$7\frac{4}{16}$ / **$9\frac{13}{16}$	0·360	0·463	1960	2,665	13·4	10·7	8·9	7·0	3
6 in.§	5 tons.	IV. / VI.	173·5	26·0	8·0	26·75		35 / 30		48 E.X.E.			6·0											
6-in.	7·4 tons.	VII. / VIII.	269·5	45	8·5	32·7		30		..	20 0	20	6·0	100	9	0·360	0·463	2535	4,453	19·8	16·2	13·0	10·4	$4\frac{1}{2}$
5-in.	38 cwt. / 40 cwt.	II. / III. IV. & V.	139·15	25·07 / 25·0	5·75	19·05		25		15·5 S.P.	4 $7\frac{1}{4}$	7·5	5·0	50	$7\frac{12}{16}$ / $3\frac{5}{16}$	0·500	0·400	1750	1,062	8·8	6·6	5·3	4·1	..
4-in.	23 cwt. / 26 cwt.	II.II$_P$ III.III$_A$ IV.V.& VI.	120·0	27·0	5·3	18·5	120	30		12 S.P.	3 1	5	4·0	25	$1\frac{12}{16}$ / $3\frac{3}{16}$	0·640	0·391	1900	625	7·7	5·4	4·0	3·0	..
12-pr.(3·0)	6 cwt.	Wire I. (L.)	66·75	19·66	3·2	8·35	105	28		..	0 $12\frac{7}{16}$	5	3·0	‖12·5	..	0·720	0·463	1553	209	..	..	..	..	..

* The Roman numeral is the number of the pattern given. Further differences in pattern are indicated by letters a, b, and c.
† P. means Polygroove; Pl., Plain; W., Woolwich; F., French; F.M., French modified; H., Henry; E.O.C. Elswick Ordnance Co.
‡ S.B.C. (in column for charge) means Slow-burning Cocoa; P.Bl. stands for Prismatic Black; P.Br. for Prismatic Brown; Pb., Pebble; R.L.G., Rifle Large Grain; L.G., Large Grain; E.X.E. Experimental letter E.
§ For 6-in. (VII.) see Q.F. table. ‖ Shrapnel. ** Cast steel. ‡‡ Forged steel. *a* At 60° Fahr. At 80°, V. = 2526 f.s. E. = 37,600 ft. tons. Perftn. = 40·6 in.

BRITISH RIFLED ORDNANCE—*continued.*

(Compiled from the official "List of Service Ordnance, 1898." Supplemented by subsequent information.)

Ordnance. Nature. Calibre or Pr.	Ordnance. Nature. Weight.	Ordnance. Nature. Mark and Service.	Ordnance. Total length in inches.	Ordnance. Length of Bore, including Chamber.	Ordnance. Chamber. Diameter.	Ordnance. Chamber. Length to base of projectile.	Ordnance. Rifling. Twist one turn in Least at breech.	Ordnance. Rifling. Twist one turn in Greatest at muzzle.	Ordnance. Rifling. System.*	Charge. (full). Weight.	Charge (cordite). Weight.	Charge (cordite). Size.	Projectile. Diameter.	Projectile. Weight.	Projectile. Bursting Charge of Common Shell.	Projectile. Value of $\frac{d^2}{w}$.	Projectile. Value of $\frac{w}{d^3}$.	Projectile. Muzzle velocity.	Ballistics (with full charges). Total muzzle energy.	Ballistics. Muzzle energy per ton of gun.	Ballistics. Perforation of wrought iron. At muzzle.	Perforation. At 1000 yards range.	Perforation. At 2000 yards range.	Perforation. At 3000 yards range.
QUICK-FIRING GUNS (using metal cases)				cals.	ins.	ins.	cals.	cals.		lbs.	lbs. ozs.		ins.	lbs.	lbs.			f. s.	ft. tons.	ft. tons.	ins.	ins.	ins.	ins.
6·0 in.	7 tons	I. & III. / II. (Wire)	219·25	40	..	..	60	30	P.	..	13 4	30	6·0	100·0	..	0·360	0·463	2200	3356	479	15·9	12·7	10·2	8·2
6·0 in. Q.F.C.	5 "	I. to VI.	169·1 / 166·6	26·2 / 26·6	.. / ..	.. / ..	.. / ..	.. / ..										1913	2537	362	13·0	10·3	8·2	6·4
4·7 in.	41 cwt. / 42 "	I. II. III. & IV. Wire	194·1	40	..	..	100 / 0	31·4 / 30	E.O.C.	..	5 7	20	4·72	45·0	.,	0·495	0·428	2188	1494	711	12·4	9·2	6·6	..
4 in.	26 cwt.	I. II. III. Wire / converted guns	165·25 / 120	40 / 28	..	..	..	30	M.Pl.	..	3 9	15	..	25·0	..	0·640	0·390	2300 / 2177	917 / 821	705 / 569	10.5 / 9·5	6·9 / 6.5	4·9 / 4.6	.. / ..
12-pr.	12 cwt.	I.	123·6	40	..	..	120 / 0	28 / 30	E.O.C. / M.Pl.	..	1 15	10	3·0	12·5	..	0·667	0·500	2210	423	677	8·1	5·3	3·5	..
12-pr.	8 cwt.	I.	87·6	28	..	..	60 / 0	28 / 30	E.O.C. / M.Pl.	..	13¾	10	3·0	12·5	..	0·667	0·500	1607	223·8	544	4·9	3·2	2·4	..
Hotchkiss . 6-pr...	8 cwt.	I. & II.	97·63	40·0	..	..	180	29·9	M.Pl.	..	b7¾	5	2·24	6·0	..	0·836	0·534	1818	137·5	344·8	4·8	2·8	..	..
Nordenfelt . 6-pr...	6 cwt.	I. II. & III.	104·4	42·3	..	..																		
Hotchkiss . 3-pr ..	5 cwt.	I. & II.	80·63	40	..	..	25	25	M.Pl.	..	b6⅜	5	1·85	3·3	..	1·037	0·521	1873	80·3	321·2	4·1	2·1	..	..
Nordenfelt . 3-pr...	4 cwt.	I. L.	91·5	45·4									..	..	..	..	..	1920	84·3	337·2	4.3	2·2	..	..
MACHINE GUNS.										grains.				oz. grs.										
Nordenfelt, 2 bar 1-in.	180 lbs.	I.	52		..	..	35	35	H.	625 M.G.	..	..	1·0	7¼ 0	..	2·207	0·453	..	..	..	¼-in. at 200 yards.			
" 4 bar 1-in.	447 lbs.	III.†	57·0		..	..	35	35	H.															
" 5 bar 0·45-in.	160 lbs.	I. G. G.	46·0		..	..	22	22	H.	85 R.F.G.$_2$	..	..	0·450	480	..	2·952	0·751	..	..	..	Same as M.H. Rifle, which perforates ⅛ in. wrought iron plate at 600 yds., $\frac{3}{16}$ in. at 400 yds., ¼ in. at 100 yds.			
	143 lbs.	II. G. G.	42·25		..	..	22	22	H.															
Gardner, 1 bar 0·45-in.	76 lbs.	I. G. G.	47·0		..	..	22	22	H.															
" 2 bar 0·45-in.	120 lbs.	I. G. G.	47 0		..	..	22	22	H.															
" 5 bar 0·45 in.	268 lbs.	I. G. G.	53·5		..	..	22	22	H.															
Maxim, 1 bar 0·45 in.	63 lbs.	I. G. G.	43·75 / 45·0		..	..	22 / 10	22 / 27	H. / Enf'ld	31 Cordite	..	..	0·450	480	..	2·952	0·751	..	..	..	Same as M.H. Rifle.			
Maxim, ·303			42·38				10	25·6	Metf'd				0·303	215	..	..	..	..	..	..	Same as Lee-Metford.			

* P. means Polygroove; M.Pl., Modified plain; W., Woolwich; F., French; F.M., French modified; H., Henry; E.X.E., Experimental letter E.

† I. and II. differ chiefly in being 7 lbs. lighter; I. has a pitch of rifling of 1 in 60 in.; G.G., Gardner Gatling; H., Henry. b With 4 grs. R.F.G. ‡ With a new gun at Portsmouth and must be regarded as the maximum effect.

§ This gun has no metal cartridge. *Note.*—An armour-piercing shell has now come in for the 6-in. guns.

	Krupp Steel B.L. & Q.F. Guns.								
Designation by Calibre, in centimètres	30·5 L. 35 C. 80	24 cm. L. 40 C. 94	24 L. 35 C. 86	15 L. 40 C. 94	15 L. 35 C. 86	15 L. 35 C. 80	12 L. 40	12 L. 35 C. 80	12 L. 35 C. 87
Calibre, in inches	12·01	9·45	9·45	5·87	5·87	5·87	4·72	4·72	4·72
Length — Total, in feet	35·11	..	27·60	..	17·13	17·13	..	13·8	13·8
Length — Rifled Portion, in ins.	314·8	..	237·7	..	151·4	153·6	..	128·5	126·3
Length — Powder Chamber in ins.	69·9	..	65·2	..	37·3	35·4	..	24·0	26·3
Length — Of bore in calibres	35	37 4	35	37·0	35	35·0	37	35·0	35
No. of Grooves	68	..	25	..	36	36	..	32	32
Twist in calibres	45·25	..	26·9	..	45–25	25	..	25	25
Weight — Gun, tons	47·2	27·8	26·6	4·39	5·7	4·69	1·97	2·25	2·31
Weight — Breech Block, in lbs.	3306·9	..	1776·9	..	445·3	463·0	..	253·5	211·6
Weight — Steel Shell "	1003·1	474	474·0	100	112·5	86·0	52·4	57·3	57·3
Weight — Common Shell "	1003·1	474	474·0	100	112·5	69·9	52·4	57·3	57·3
Weight — Shrapnel Shell "	..	..	..	..	112·4	71·9	..	57·3	57·3
Weight of Bursting Charge — Case Shot "	..	..	..	..	..	..	..	..	..
Weight of Bursting Charge — Steel Shell "	10·6	..	5·1	..	1·3	1·76	..	0·55	0·55
Weight of Bursting Charge — Common Shell "	97·7	..	17·9	..	5·29	3·86	..	2 2	2·2
Weight of Bursting Charge — Shrapnel Shell "	..	..	..	..	1·26	1·10	..	0·57	0·57
Weight of Firing Charge — Steel Projectile, in lbs.	156·5 24 cm.N	91·5	99·2N	18·3	22·5 15 cm.N	38·8*	‡ 9·7	19·8 B	12·13N
Weight of Firing Charge — Common Shell, in lbs.	156·5 N 24 cm.N	91·5	99·2N	18·3	22·5 15 cm.N	38·8*		19·8 B	12·13N
Weight of Firing Charge — Shrapnel, in lbs.	..	..	..	..	..	..	..	..	..
Weight of Firing Charge — Exercising, in lbs.	154·3B	..	..	..	28·7	19·6	..	11·0	6·6 N
Weight of Firing Charge — Saluting "	19·8 O	..	15·4O	..	4·74	4·74 O	..	2·4 O	2·4 O
Muzzle Velocity, in feet	1969	2264	2100	2264	2133	1969	2264	1755	2133
Muzzle Energy — Total, foot-tons	26,970	..	14,500	..	3549	2312	3554	1215	1808
Muzzle Energy — Per inch circumference, foot-tons	714·8	16,845	488·3	3554	192·5	125·4	..	82·5	122·2
Thickness of Iron, perforated inches at Muzzle, by Tresidder's formula	30·1	29·0	25·8	17·0	16·1	12·6	13·7	9·7	12·9
Perforation of Krupp Steel, 3000 yds., inches	10	8	7	..	..	..	..	..	..

NOTE.—C for cube powder; * prismatic powder; O, ordinary powder; B, brown prismatic. N, nitro-glycerine smokeless powder.
† By Krupp's formula. ‡ By Fairbairn's formula.
There are also Q.F. Skoda 7 cm., Skoda and Hotchkiss 47 mm., another 47 mm. and Hotchkiss 37 mm.
It is believed that guns with at least 2500 M.V. are under construction.

DANISH NAVAL ORDNANCE.

	Krupp B.L. Guns designated.													
Designation by Calibre	35·5 cm.	30·5 cm.	26 cm. long.	26 cm. short.	24 cm.	24 cm.	21 cm.	15 cm.	15 cm. long.	15 cm. medium.	15 cm. short.	12 cm. long.	12 cm.	8·7 cm.
Calibre, in inches	13·98	12·01	10·24	10·24	9·4	9·4	8·24	5·9	5·91	5·91	5·91	4·72	4·7	3·43
Total length, in feet	29·1	22·0	32·8	18·77	31·4	31·6	24·04	..	17·1	12·63	10·7	11·8	..	11·5
Length of Bore, including Powder Chamber, in inches	304·7	227·2	327·6	194·5	..	..	264·5	..	190·3	135·0	112·9	128·8	..	..
Length of Bore, including Powder Chamber, in calibres	21·8	18·9	32·0	19·0	37	37·5	35	40	32·2	22·8	19·1	27·3	37·5	37·1
Number of Grooves	80	68	60	60	..	..	48	..	36	36	36	32	..	..
Twist of Rifling, in calibres	45	45	70–25	45	..	..	70–25	..	70–25	45	45	25	..	..
Total weight, including Breech-gear, tons	51·3	35·4	27·6	21·6	25·4	22·9	13·3	..	4·7	4·4	3·5	2·13	..	..
Weight of Breech Block, lbs.	4695·8	2910	2006	1940	..	..	903·9	..	390·2	330·7	324·1	229·2	..	..
Weight of Steel Shell, "	1157·4	725·3	451·9	451·9	353	353	238·1	112	112·4	..	86·0	..	44	..
Weight of Chilled Shell, "	1157·4	725·3	..	451·9	..	..	..	..	..	86·0	86·0	..	..	..
Weight of Common Shell, "	1157·4	725·3	451·9	451·9	230	353	238·1	112	112·4	69·4	69·4	57·3	44	20
Weight of Shrapnel Shell, "	1157·4	725·3	451·9	451·9	..	..	238·1	..	112·4	86·0	86·0	57·3	..	..
Weight of Case Shot, "	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Weight of Bursting Charge, Common Shell, "	57·3	39·7	25·4	25·4	16·5	16·5	12·8	6·2	6·2	3·0	3·0	1·7	..	..
Weight of Firing Charge, Steel or Chilled Shell, lbs.	330·7	180·2	191·8	101·4	..	75*	105·8	20·9*	41·9	19·3	21·8	17·4	9·7*	3·59*
Weight of Firing Charge, Common Shell, "	330·7	180·2	191·8	112·4	..	75*	105·8	..	41·9	19·3	21·8	17·4	..	..
Muzzle Velocity, Armour-piercing Projectile, feet	1762	1675	2018	1640	2159	2362	2021	2264	1800	1565	1542	..	2460	2379
Muzzle Velocity, Common Shell, "	1762	1675	2018	1640	..	..	2021	..	1890	1683	1690	1720	..	..
Muzzle Energy, Total foot-tons	24910	14110	12770	8428	11,440	13,656	6745	3981	2784	1461	1418	..	1846	780
Muzzle Energy, Per inch circumference, foot-tons	568·3	374·1	396·8	262·0	..	..	260·6	..	150·0	78·7	73·0	..	..	..
Perforation at Muzzle, wrought iron, Tresidder's formula	25·6	20·1	22·9	16·8	23·3	26·7	18·5	17·8	15·6	12·6	..	..	14·2	10·7
Perforation Krupp Steel, 3000 yards, inches	7	5½	6	4¾	6	7	5	3½	3	..	..	..	..	..

Note.—Chilled projectiles will gradually be replaced by steel. * Smokeless powder.

There is also a 44-calibre 5-pr. Hotchkiss, V. = 2362 f.s.

DUTCH NAVAL ORDNANCE.

	Krupp Breech Loading Q.F.											Dutch Breech Loading.
Designation by Calibre, in centimètres	28	24	21	21	21	No. 2.	15	15	12	12	12	12*l*
Calibre, in inches	11·0	9·4	7·91	8·2	8·2	5·87	5·9	5·9	4 7	4·7	4·72	4·72
Total Length, in feet	27·5	31·6	24·04	24·0	27·5	17·13	17·1	19·7	13 9	15·9	13·78	13·78
Length of Rifled Portion of Bore, in inches	..	..	222·2	..	..	151·4	..	..	..	..	128·5	..
Length of Powder Chamber "	..	..	42·4	..	..	37·7	..	..	..	..	24·0	..
Length of Bore, in Calibres	27	37	35	32	37·1	35	32	37	32 3	37·3	35	35
Number of Grooves	..	..	$\frac{48}{64}$	..	..	44	..	..	..	..	32	32
Depth of Grooves, inches	..	..	0·059	..	..	..	..	..	..	..	..	0·06
Twist of Rifling, in Calibres	..	..	$\propto$ 25	..	..	25	..	..	..	..	25	$\propto$ 45
Total Weight, in tons	27	25·3	$\frac{12·79}{13·98}$	14·0	16·2	4·72	3·8	4·7	1·9	2·7	2·26	2·31
Firing Charge { Armour-piercing Projectile, in lbs.	185	..	99·2	119	..	49·6	15·4	18·5	..	..	19·8	19·5
Firing Charge { Common Shell "	..	..	99·2	..	..	49·6	..	..	..	..	19·8	19·8
Weight { Armour-piercing Projectile "	761	474	308·6	309	309	112·2	100	88·2	52·4	57·4	57·3	57·3
Weight { Common Shell "	..	..	308·6	..	..	112·2	..	..	..	..	57·3	57·3
Weight { Case Shot "	..	..	..	..	..	..	..	..	..	..	57·3	..
Bursting Charge { Armour-piercing Projectile "	..	..	4·6	..	..	..	..	..	..	..	..	..
Bursting Charge { Common Shell "	20	..	12·3	..	..	..	..	..	..	..	..	..
Muzzle Velocity, feet	1627	2067	1739	1903	2067	2001	2034	2461	2034	2067	1755	1804
Muzzle Energy { Total, in foot-tons	13,960	14,050	6471	7760	9756	3115	2867	3703	1503	1689	1224	1264
Muzzle Energy { Per inch Circumference, foot-tons	..	..	260·7	..	..	169·0	..	..	..	..	82·5	85·2
Perforation at Muzzle, in inches	20·0	25·3	{16·8 / 17·1}	19·4	21·9	{13·6 / 14·8}	14·3	17·9	11·6	12·4	{9·4 / 10·1}	9·6
Perforation Krupp Steel, 3000 yards	5½	7	3½	4½	5	..	..	..	..	..	..	..

FRENCH NAVAL ORDNANCE.

Date and Pattern of Gun.	Model 1893–96.				Model 1893.					Model 1887.			
Desig. by Calibre, in cms.	30·5	27·44	24·0	19·4	34·0	30·5	27·44	24·0	19·4	34	30·5	27	19
Calibre, in inches	12·01	10·8	9·45	7·64	13·39	12·0	10·8	9·45	7·64	13·39	12·0	10·80	7·64
Total length, in feet	..	..	..	..	..	..	..	..	..	..	..	..	..
Length of Bore, in ins.	..	..	..	..	..	..	..	..	..	..	..	..	..
Length of Bore, in cals.	45	45	40	40	35	40	45	40	40	42	45	45	45
Number of Grooves	..	..	..	..	..	..	..	..	..	..	..	..	..
Depth of Grooves, inches	..	..	..	..	..	..	..	..	..	..	..	..	..
Rifling Twist	..	..	..	..	..	..	..	..	..	..	..	..	..
Total weight, in tons	44·4	34·5	23·6	12·5	52·9	45·9	34·9	22·4	10·6	60·0	49·2	37·1	10·6
Weight of Firing Charge: Armour-piercing Projectile, lbs.	246	188·5	145½	74	243·0	198·4	114·6	110·2	44·1	220·5	198·4	114·6	44·1
Weight of Firing Charge: Com. Shell lbs.	..	..	..	..	..	..	..	..	..	..	..	..	..
Weight: Armour-piercing Projectile* lbs.	750	562	375	190	925·9	643·8	476·2	317·5	165·3	925·9	643·8	476·2	165·3
Weight: Com. Shell "	644	476	317	165	..	..	..	..	..	..	..	..	..
Weight: Case Shot "	..	..	..	..	..	..	..	..	..	..	..	..	..
Muzzle Velocity, in f.-s., A.P. Projectile	2650	2650	2870	2870	2400	2625	2625	2625	2625	2560	2625	2625	2625
Muzzle Energy: Total, in f.-t.	36782	27186	21445	10890	36850	30750	22750	15170	7898	42040	30750	22750	7898
Muzzle Energy: Per in. circ., f.-t.	..	..	..	..	..	815·8	670·7	511·1	329·1	..	815·8	670·7	329·1
Perforation at Muzzle† wrought iron, inches.	42·7	38·8	37·0	29·0	36·8	37·3	33·7	29·4	23·4	40·8	37·3	33·7	23·4
Perforation Krupp Steel 3,000 yds.	13½	11½	10½	6¾	11½	11	9	7½	5½	13	11	9	5½

Date and Pattern of Gun.	1884.					1881.						
Desig. by Calibre, in cms.	34	27	24	16	14	34 long.	34 short.	27	24	16 heavy.	16 light.	14
Calibre, in inches	13·39	10·80	9·45	6·49	5·45	13·39	13·39	10·8	9·45	6·49	6·49	5·46
Total length, in feet	..	28·47	24·89	17·04	..	33·69	25·32	27·12	23·70	15·14	15·14	14·3
Length of Bore, in ins.	..	..	..	..	..	380·6	280·2	306·9	269·3	180·9	180·9	162·6
Length of Bore, in cals.	30	30	30	30	30	28·5	21·0	28·5	28·5	28	28	28
Number of Grooves	..	..	..	..	..	..	..	..	..	50	50	42
Depth of Grooves, inches	..	..	..	..	..	0·067	0·067	0·059	0·055	0·039	0·039	0·035
Rifling Twist	..	..	..	..	..	7°	7°	7°	7°	7°	7°	7°
Total weight, in tons	50·8	27·7	17·9	5·4	3·15	52·2	47·2	27·4	17·7	4·9	3·9	3·2
Weight of Firing Charge: Armour-piercing Projectile, lbs.	388·0	200·6	..	42·5	..	388·0	337·3	203·9	149·9	42·5	32·6	..
Weight of Firing Charge: Com. Shell lbs.	..	200·6	..	42·5	27·1	337·3	368·2	203·9	149·9	42·5	32·6	27·1
Weight: Armour-piercing Projectile* lbs.	925·9	476·2	317·5	99·2	..	925·9	925·9	476·2	317·5	99·2	99·2	..
Weight: Com. Shell "	771·6	396·8	264·6	99·2	66·1	771·6	771·6	396·8	264·6	99·2	99·2	66·1
Weight: Case Shot "	..	..	..	..	..	..	..	..	..	130·7	130·7	61·7
Muzzle Velocity, in f.-s., A.P. Projectile	1969	1969	1969	1969	1969	1969	1804	1969	1969	1969	1821	1936
Muzzle Energy: Total, in f.-t.	24900	12800	8539	2668	1777	24900	20880	12800	8539	2668	2080	..
Muzzle Energy: Per in. circ., f.-t.	591·9	377·5	287·7	130·8	103·9	591·9	496·6	377·5	287·7	130·9	121·3	..
Perforation at Muzzle† wrought iron, inches.	27·6	22·0	19·2	13·0	10·7	27·6	24·2	22·0	19·2	13·0	11·6	..
Perforation Krupp Steel 3,000 yds.	7½	6	5½	3	..	7½	7	6	5½	3	..	..

* Steel or chilled iron.

† By Tresidder's formula.

Date and Pattern of Gun.		75–79.	Q.F. Guns.							
			*164·7	16§	16‡	14§	14	Mod. 92. 10	Mod. 91. 10	Mod. 81. 10‡
Desig. by Calibre, in cms.		37	16·47			13·86		10·00		
Calibre, in inches		14·57	6·46			5·44		3·94		
Total length, in feet		36·7								
Length of Bore, in inches		414·0								
Length of Bore, in calibres		28·5	45	45	30	45	30	60	50	26
Number of Grooves		..								
Depth of Grooves, inches		0·079								
Rifling Twist		7°								
Total weight, in tons		**75·1	8·1	6·89	4·92	4·13	3·84	2·19	1·62	1·18
Weight of Firing Charge	Armour-piercing Projectile * . . lbs.	463	44	30·2	19·0	16·1	12·8	8·16	8·16	5·07
	Common Shell „	463								
Weight	Armour-piercing Projectile . . lbs.	1235	115	99·21		66·14		30·87		
	Common Shell „	1014								
	Case Shot „	..								
Muzzle Velocity, in ft.-secs.		1969	2870	§2625	2100	2625	2100	2500	2428	1840
Muzzle Energy	Total, in foot-tons	33210	6568	4730	3061	3160	2022	1340	1266	725
	Per in. circ., foot-tons	725·4	..	233·5	150·9	184·9	118·7	..	..	..
Perforation at Muzzle, wrought iron, inches		30·5†	24·5†	20·0†	14·4†	17·7†	12·7†	13·0†	12·5†	8·2†
Perforation Krupp steel, 3,000 yards		10	5¼	3¾	..	..	..	..	..	..

* Steel or chilled iron. ** Made at St. Chamond. The Creusôt gun weighs 71·4 tons. † By Tresidder's formula.
‡ Models 1881 and 1884 converted guns. § There are three models of the years 1887, 1891 and 1893, of slightly different weights from the above.

GERMAN NAVAL ORDNANCE.

	Krupp Steel Breech-loading Guns, designated by calibre.																			Bronze B.L.	
Designation in centimètres	30·5 jack'd.	28	28	26 long.	26 jack'd.	26 short.	24 Q.F.	24 long.	24 long.	21 Q.F.	15 Q.F.	15 Q.F.	15 long.	10·5 Q.F.	10·5 Q.F.	12·5 hoop'd.	10·5 long.	8·7	6	8	8·8
Calibre, in inches	12·01	11·02	11·02	10·33	10·33	10·33	9·45	9·45	9·45	8·2	5·9	5·9	5·87	4·13	4·13	4·92	3·96	3·43	2·36	3·19	3·42
Length: Total, in feet	21·98	36·75	32·15	18·77	18·77	17·06	31·50	27·56	23·63	27·4	17·6	19·7	14·67	12·1	13·9	9·60	12·08	6·89	4·1	5·15	8·7
Length: Rifled portion, in ins.	181·9	407·9	352·8	149·8	150·0	129·3	349·6	302·4	201·6	..	..	..	128·5	..	..	85·7	113·6	62·7	44·3	45·9	..
Length: Powder Chamber „	45·3			44·7	44·4	44·7	..	..	53·5	..	..	..	31·1	..	..	16·7	19·5	10·7	..	9·73	..
Length: Bore, in calibres	18·9	40	35	18·8	18·8	16·8	..	32·0	26·1	37·0	32·2	36·0	27·2	32·2	37·2	20·8	33·6	21·4	..	17·4	..
Number of Grooves	72	..	..	36	48	36	..	..	56	..	..	..	36	..	..	32	32	24	24	12	..
Depth of Grooves, in inches	0·079	..	..	0·077	0·079	0·077	..	..	0·059	..	..	..	0·059	..	..	0·059	0·049	0·049	..	0·051	..
Twist, in calibres	45	..	..	50	50	50	..	..	25	..	..	..	25	..	..	40	25	40	..	46	..
Weight: Gun, including Breech Gear, tons	35·4	43·4	43·2	21·7	18·7	17·7	25·4	21·7	18·7	14·0	4·4	5·4	4·04	1·25	2·28	1·38	1·15	0·44	0·10	0·23	0·65
Weight: Breech Block, in lbs.	2954	..	..	2050	1973	1973	..	..	..	..	..	..	390·2	..	..	163·1	149·9	86·0	..	55·1	..
Weight: Armour-piercing projectile, in lbs.	725·3	562·2	562·2	412·3	412·3	412·3	474·0	474·0	474·0	309	88	88	112·4	40	40	..	..	..	..	..	15
Weight: Common Shell, in lbs.	725·3	474·0	474·0	357·1	357·1	357·1	474·0	474·0	474·0	309	..	..	112·4	..	..	40·1	39·7	14·9	6·61	8·3	..
Weight of Bursting Charge: Armour-piercing Shell, in lbs.	7·7	..	..	5·3	5·3	5·3	7·05	7·05	6·6	4·4	..	..	1·5	..	..	..	..	..	..	..	..
Weight of Bursting Charge: Common Shell, in lbs.	19·8	25·4	25·4	14·3	14·3	22·0	16·5	16·5	15·4	11·1	..	..	4·3	..	..	2·4	0·9	0·4	..	0·6	..
Weight of Firing Charge: Armour-piercing Shell, in lbs.	202·8	352·7	297·6	105·8	105·8	125·7	89·3	152	152·1	60·2	13·5	18·7	33·1	4·8	..	..	..	..	..	..	2·1
Weight of Firing Charge: Common Shell, in lbs.	202·8	352·7	297·6	105·8	105·8	125·7	..	..	152·1	60·2	..	..	33·1	..	..	8·8	8·8	3·3	0·88	0·9	..
Initial Velocity: Armour-piercing projectile, ft.-secs.	1713	2362	2133	1588	1588	1578	2296	1803	1657	2360	2034	2379	1624	2034	2349	..	..	..	..	..	2020
Initial Velocity: Common shell, ft.-secs.	1713	..	..	1641	1641	1654	..	..	1657	..	..	..	1624	..	..	1545	1526	1545	1545	1053	..
Muzzle Energy: Total, foot-tons	14,750	21,750	17,740	7211	7211	7119	17330	10683	9024	11934	2525	3453	2055	1119	1530	..	..	..	..	..	424
Muzzle Energy: Per in. circ., ft.-tons	391	628·4	512·4	223	223	220	..	401·2	304	..	..	..	111·5	..	..	..	..	..	..	..	..
Perforation at Muzzle, by Tresidder's formula	20·8	30·6	26·7	15·1	15·1	15·0	29·7	20·7	18·0	26·7	13·4	17·1	11·0	10·8	13·3	..	..	..	..	..	..
Perforation Krupp Steel, 3000 yards, inches	5¾	8½	7½	..	..	..	8	5¾	5¼	6½	..	3½	..	..	..	..	..	..	..	..	..

A 17-cm. Q.F. is to be introduced for the new battleships, and the 11-in. guns of the Braunschweig class will probably have 2800 f.s. velocity and 11 inches penetration Krupp steel at 3000 yards.

ITALIAN NAVAL ORDNANCE.

		Armstrong Breech Loading.					Q.F.	Armstrong B.L.	Armstrong Quick Firing.						
Designation by Calibre, in centimètres		43·1† New Pattern.	43·1† Early Pattern. 1882.	34·3	30·5	25·4	20·3	15·2	15·2	15·2	15·2	12·0	12·0	7·6
Calibre, in inches		17	17	13·5	12	10	8	6	6	6	6	4·7	4·7	3·0
Length	Total, in feet	40·75	39	36·09	..	34·8	..	16·9	17·0	20·9	20·9	16·2	13·0	..
	Rifled Bore, in inches	346·8	315·7	..	..	..	..	..	..	..	..	} 189	..	..
	Powder Chamber, in inches	84·5	98	..	..	..	..	..	..	..	..		..	..
	Bore, in Calibres	27	26	..	40	40	45	32	33·0	40	40	40	35	40
No. of Grooves		82	82	56	..	..	..	..	..	..	..	22	22	..
Twist of Rifling, in Calibres		50	50	..	..	..	..	..	..	..	..	34·4	..	..
Total Weight, in tons		104·3	101·5	67·9	..	30	..	5·4	5·1	5·7	6·5	2·05	1·69	0·6
Firing Charge	Armour-piercing projectile, lbs.	900·0	725	630·5	..	..	..	46	46	46	17·6*	..	..	..
	Common Shell, „	600	480	..	..	..	..	..	..	..	..	..	..	..
Weight	Armour-piercing projectile, „	2000	2000	1250	850	448	250	98	98	100	100	45·0	36·0	12
	Common Shell, „	2000	2000	1250	..	..	..	..	..	..	..	..	36·2	..
	Shrapnel „ „	2017	2017	1250	..	..	..	..	..	..	..	..	29·8	..
	Case Shot „	..	..	..	..	..	..	..	..	..	..	..	..	..
Bursting Charge	Armour-piercing projectile, „	32	32	17·4	..	..	..	2·0	2·0	5·1	4·4	..	1·83	..
	Common Shell, „	60	60	87·1	..	..	..	..	..	..	..	..	3·02	..
	Shrapnel „ „	5	5	4·25	..	..	..	..	..	..	..	..	0·35	..
Muzzle Velocity, in ft.-secs.		1992	1935	2016	2500	2460	2600	1952	1985	2149	2297	2180	..	2625
Muzzle Energy	Total, foot-tons	55,030	51,930	35,230	..	18,798	11,730	2577	2705	3169	3622	1490	..	573
	Per inch circumference, foot-tons	1035	976·3	830·8	..	..	..	..	..	..	..	..	..	..
Perforation at Muzzle, inches of iron by Tresidder's formula		36·7	35·0	33·0	40·0	31·0	28·3	13·2	13·6	15·4	17·0	12·4	..	10·2
Perforation Krupp Steel, 3000 yds., inches		12½	12	11	12½	8½	7	..	..	..	3½	..	..	..

* Ballistite. † There are four types of these bores, viz.—Lauria, Lepanto, Italia, Valente.

Note.—There is also a 6-inch quick-firing gun, 40 cals. M.V., 2600 f.s.

RUSSIAN NAVAL ORDNANCE.

	Obukhoff Steel Breech Loading Hooped Guns.				Steel B.L. Guns.		
Designation by Calibre, in inches	12	9	8	6 Long.	4·2 9-pdr.	3·43 Long. 4-pdr.	3·43 4-pdr.
Calibre in centimètres	30·48	22·86	20·32	15·24	10·67	8·70	8·70
Total Length, in feet	35	26·25	23·33	17·5	7·0	6·9	5·8
Length of Rifled Portion of Bore, in inches	..	..	..	..	65·0	62·6	53·0
Length of Powder Chamber, in inches	..	..	..	..	8·0	10·7	..
Length of Bore in Calibres, including Powder Chamber	31·9	35	35	35	17·4	21·4	..
Number of Grooves, in ins.	..	..	..	..	16	24	12
Depth of Grooves in ins.	..	..	..	..	0·055	0·050	0·050
Twist of Rifling in cals.	..	..	..	..	50	40	41
Total Weight, in tons	55·7	19·44	13·64	6·26	0·87	0·45	0·35
Weight of Steel Shell, in lbs.	731	..	..	..	..	..	..
Weight of Chilled Shell, in lbs.	..	268·2	192·3	73·35	24·2	15·2	12·6
Weight of Common Shell, in lbs.	..	..	..	..	22·3	15·2	11·0
Weight of Case Shot, in lbs.	..	..	..	89·38	..	..	..
Weight of Firing Charge, Steel Shell, in lbs.	338	..	..	39·6	..	..	..
Weight of Firing Charge, Chilled Shell, in lbs.	..	180	88·2	39·6	2·6	3·1	1·3
Weight of Firing Charge, Common Shell, in lbs.	..	..	..	..	..	..	..
Muzzle Velocity, in feet	2090	2376	1925	2080	..	1444	..
Muzzle Energy, Total, foot-tons	..	10500	..	2682	..	..	..
Muzzle Energy, Per Inch Circumference, foot-tons	22·130	371·4	..	142·3	..	..	..
Perforation at Muzzle, in inches	..	20·2	..	12·50	..	..	..
Perforation at Muzzle, by Tresidder's formula	28·3	24·0	15·7	..	..	..	..
Perforation Krupp Steel, 3000 yds., inches	8	6	..	..	..	..	..

There exist also 15 and 10·7 cm. Krupp guns.

NEW PATTERN RUSSIAN NAVAL GUNS.

The following guns are in use in the Russian Navy, the ballistics being somewhat as under :—

	12-in.	10-in.	9-in.	8-in.
Length	40 cals.	45 cals.	45 cals	45 cals.
Projectile	720 lbs	488 lbs	403 lb.	188 lbs
Muzzle Velocity	2600f.s	2600f.s	2500f.s	2800f.s
Perf. Wt. Ir. Muzzle	38 ins.	35 ins.	32 ins.	27 ins.
Perf. Wt. Ir. 2000 yds.	30 „	27 „	24 „	20 „
Perf. K.S. 3000 yds.	12 „	10½ „	8½ „	6½ „

Q.F. GUNS.

	6-in.	4·7-in.	12-pdr.
Length	45 cals.	95 cals	50 cals.
Projectile	89 lbs.	46 lbs.	12 lbs.
Muzzle Velocity	2900 f.s.	2600 f.s.	2700 f.s.
Perf. Wt. Ir. Muzzle	22½ ins.	15½ ins.	10·2 ins.
Perf. Wt. Ir. 2000 yds.	13 „	9 „	4·8 „
Perf. K.S. 3000 yds.	4¾ „	..	..

	Hontoria, Pattern 83.								Armstrong, Pattern 83.			Armstrong.			Krupp.							
	Breech Loading.											Muzzle Loading.		Pattrn. 81 B.L.	Breech Loading.		Q.F. guns.					
Designation by Calibre	32-cm.	28-cm.	24-cm.	20-cm.	18-cm.	16-cm.	14-cm.	12 cm.	12-cm.	8·7-cm.	7·5-cm. long.	22·86-cm	20·3-cm	6-in.	15-cm.	12-cm.	15-cm.	14-cm.	12-cm.	75-mm.	57-mm.	47mm.
Calibre, in inches	12·60	11·02	9·45	7·87	7·09	6·34	5·51	4·72	4·72	3·4	2·95	9·00	8·00	6·00	5·87	4·72	5·9	5·51	4·72	2·95	2·24	1·85
Length: Total length, in feet	38·7	33·8	29·0	..	21·75	19·3	16·91	14·5	13·75	7·9	7·50	13·0	11·0	14·5	17·13	11·81	19·6	20·7	..	..	..	..
Length: Rifled Portion, in inches	352·4	309·1	..	..	..	170·6	149·1	126·0	135·8	75·0	70·7	104·0	102·0	126·9	..	..	..	..	..	..	..	..
Length: Powder Chamber, in inches	86·8	77·1	..	..	..	49·8	53·9	39·4	19	13	13	..	..	29·7	..	..	..	..	..	..	..	..
Length: Bore, in calibres	35	35	30	..	30	35	35	35	33	27	28·7	14	14·75	26·1	35	30	37	45	45	40	42	40
No. of Grooves	80	70	60	50	45	40	35	30	22	20	18	6	4	28	36	32	..	..	..	..	..	..
Depth of Grooves, in ins.	0·06	0·06	0·05	0·06	0·04	0·04	0·04	0·04	0·03	0·03	0·03	0·18	0·18	..	0·06	0·06	..	..	..	..	..	..
Twist of Rifling, in cals.	From 0 to 30.								40	30	35	45	40	100 to 40	25	25	..	..	..	..	..	..
Total Weight, in tons	47·3	32·5	20·7	11·5	8·71	6·1	4·1	2·6	2·2	0·45	0·35	12·0	9·0	4·0	4·7	2·1	4·39	4·8	2·65	0·9	0·34	0·23
Weight: Armourpiercing projectile, in lbs.	1041	694·3	438·7	253·5	187·4	130·1	86·0	53·1	39·2	..	..	250·0	180·0	78·3	84·9	43·65	100	70	55	14	6	3·3
Weight: Common Shell, in lbs.	879·6	586·4	370·4	213·8	..	112·4	75·0	47·2	36·4	14·1	11·5	250·0	180·0	73·6	65·5	34·61	..	..	..	..	..	..
Weight: Ring Segment, in lbs.	886·3	590·8	370·4	211·6	..	112·4	75·0	47·6	38·6	15·4	11·7	..	..	83·6	..	34·61	..	..	..	..	..	..
Firing Charge: Armour-piercing projectile, in lbs.	485·0	352·7	220·5	112·4	94·8	66·1	44·1	28·7	16·0	..	..	50·0	35·0	34·0	37·48	19·29	..	..	15·4	7·1	1·93	..
Firing Charge: Other projectiles	463·0	319·7	220·5	..	..	61·7	..	28·7	11·9	4·0	4·0	33·0	21·0	24·9	25·4	..	..	..	..	..	..	..
Muzzle Velocity, in feet	2034	2034	2034	2034	2034	2054	2001	1988	2000	1625	1709	1339	1339	1929	2001	1887	2264	2460	2423	2100	1870	2330
Muzzle Energy: Total, in ft.-tons	29850	24030	12580	7271	5374	3806	2386	1511	1087	258	233	3105	2239	2018	2357	1076	3554	2936	2238	428	145	124
Perforation at Muzzle, in inches	32·9	28·7	24·6	20·5	18·6	16·6	13·9	11·6	9·3	..	..	10·6	9·6	11·0	12·7	9·7	17·0	16·5	15·5	7·9	5·0	5·7
Perforation Krupp Steel, 3000 yards	11	8	6¼	4¾	4¼	3½	..	..														

Note.—The Carlos V. has 11-in. 45 cal. guns. M.V. probably 2500 f.s.

NAVAL ORDNANCE OF SWEDEN AND NORWAY.

	Sweden.								Norway.										
	Armstrong.			Bofors.	New Pattern Q.F.		M. 85.	M. 89.	Modern Guns.										
Designation by Calibre, in cms.	25	25	24	21	15 Q.F.	12 Q.F.	25	15	21	21 Q.F.	21 Q.F.	15	15 Q.F.	12 Q.F.	12 Q.F.	76mm.	7cm.
Calibre, inches	10	10*	9·45	8·2	5·9	4·7	10·00	6·0	8·24	8·0	8·24	5·9	..	4·7	4·7	3·0	2·8
Total Length, feet	29·5	28·6	27·0	30·7	22·2	17·9	28·33	16·98	24·0	27·9	31·3	19·6	..	..	..	..	..
Length: Rifled Portion of Bore, ins.	..	..	..	..	..	..	2609	155·2	..	..	..	..	..	..	..	..	..
Length: Chamber, "	..	..	..	..	..	..	58·1	35·2	..	..	..	..	..	..	..	..	..
Length: Bore in calibres, "	32	35	32·4	43	..	43·3	32·9	32	32	40	43·8	37·1	43·8	45	43·9	40	38
Number of Grooves	..	..	..	..	..	..	42	28	..	..	..	..	..	..	..	..	..
Twist of Rifling	..	..	..	..	..	..	40	30	..	..	..	..	..	..	..	..	..
Total Weight, tons	29·5	28·6	23·5	16·3	5·8	2·7	29·8	5·2	13·9	15·5	18·7	5·6	..	3·1	2·65	0·6	0·63
Weight of Armour-piercing Shell in lbs.	450	450	400	309	100	46	449·7	100	309	210	309	112	..	46	45	12·5	10·3
Weight of Common Shell, in lbs.	401	401	..	..	..	..	401·2	100	..	..	..	..	..	..	..	..	..
Weight of Firing Charge: Armour-piercing Shell, in lbs.	242	smoke-less	182	..	18	9·15	242·5	54·0	115	32	47	58·4	..	6·6	8·4	1·7	1·9
Weight of Firing Charge: Common Shell, lbs.	..	..	..	..	..	..	242·5	..	..	..	..	..	..	..	..	..	..
Muzzle Velocity, feet.	2100	2362	2051	2297	2460	2428	2100	2067	1903	2242	2300	2070	2502	2361	2570	2200	2379
Muzzle Energy, Total foot-tons	13760	17406	11670	11303	4196	1893	13750	2964	7760	7319	11344	3328	..	1785	2060	419	404
Perforation through Iron by Tresidder's formula	24·5	29·2	22·9	25·7	18·9	14·2	24·5	13·9	19·2	20·2	25·6	15·6	..	13·6	15·3	8·0	8·4
Perforation Krupp Steel, 3000 yds.	6	8	6	6½	4¼	..	6½	..	4¾	4¾	6½	..	..	..	..	..	..

* Schneider-Canet. There are also 6-pdrs., with M.V. 2165 f.s. to 2310 f.s., and 3-pdrs., with M.V. 2428 f.s.

UNITED STATES NAVAL ORDNANCE.

NATURE OF GUN.	Calibre.	Weight.	Total Length.	Total Length of Bore.	Length of Rifling.	Twist of Rifling.	Length of Chamber.	Weight of Service Charge. Brown Powder.	Weight of Service Charge. Smokeless Powder.	Weight of Projectile.	Muzzle Velocity (Service). Brown Powder.	Muzzle Energy. Brown Powder.	Perforation of Wrought Iron at Muzzle.†	Perforation of Krupp Steel at 3000yds.
	inch.	tons.	feet.	inch.	inch.		inch.	lbs.	lbs.	lbs.	ft.-seconds.	ft.-tons.	inch.	inch.
3-in. (14 pr.)	3	0·87	12·5	149·7	125·5	..	21·3	..	5	14	3000	874	13·5	..
4-in. Q.F., Mark I.	4	1·5	13·7	157·3	130·3	zero to 1 in 25	24·7	12 to 14	..	33	2000	915	9·8	..
4-in. Q.F. Gun	4	1·5	13·7	157·5	128·1	..	25·4	..	..	33	2000	..	9·8	..
4-in. Q.F., Mark VII., of 50 Cals.	4	2·56	17·0	200·0	168·4	..	31.6	..	15	32	2900	1,999	16·9	..
5-in. Q.F., Mark I.	5	2·8	13·5	150·3	120·8	1 in 180 to 1 in 30	27·1	26 to 29	..	60	2000	1,660	11·8	..
5-in. Q.F. Gun	5	3·1	17·4	191·5	164·4	zero to 1 in 25	32·0	28 to 30	..	50	2300	1,834	13·2	..
5-in. Q.F., Mark V.	5	4·46	21·3	250	212·9	..	37·2	..	27	60	2900	3,503	20·5	4¼
6-in. B.L.R., Mark I.	6	4·8	15·8	176·0	136·7	1 in 180 to 1 in 30	36·9	50	..	100	2000	2,773	..	..
6-in. B.L.R., Mark II.	6	4·9	16·1	180·1	144·9	..	32·7	45 to 48	..	100	2000	..	13·8	..
6-in. B.L.R., Mark III., of 30 Cals.	6	4·8	16·3	183·8	147·3	zero to 1 in 25	34·0	44 to 47	..	100	2000	..	..	..
6-in. B.L.R., Mark III., of 35 Cals.	6	5·2	18·8	213·8	177·3	..	34·0	..	..	100	2080	2,990	14·7	..
6-in. B.L.R., Mark III., of 40 Cals.	6	6·0	21·3	243·8	207·3	..	34·0	..	..	100	2150	3,204	15·4	..
6-in. Q.F. Gun	6	6·0	21·3	243·8	204·3	..	37·0	44 to 47	..	100	2150	3,200	15·4	..
6-in. Q.F., Mark VI.	6	8·17	25·0	293·7	245·3	..	48·4	..	46	100	2900	5,838	24·2	5
7-in. Q.F.	7	..	..	..	..	..	..	..	74	165	2900	9,646	28·7	6½
8-in. B.L.R., Mark I.	8	12·3 12·9	21·5	239·9	195·2	1 in 180 to 1 in 30	42·1	105 to 115	..	250 250	2000 2000	6,932	19·0	4½
8-in. B.L.R., Mark II.	8	13·0	21·5	239·9	195·2	..	42·1	..	..	..	..	..	19·0	4½
8-in. B.L.R., Mark III., of 35 Cals.	8	13·1	25·4	290·5	242·8	zero to 1 in 25	45·1	..	..	250	2080	7,498	20·1	4¾
8-in. B.L.R., Mark III., of 40 Cals.	8	15·2	28·7	330·5	282·8	..	45·1	..	..	250	2150	8,011	21·1	5
8-in. B.L.R., Mark V., of 45 Cals.	8	18·0	28·6	335·0	271·0	..	64·0	..	115	250	2800	13,602	31·4	8
10-in. B.L.R., Mark I., of 30 Cals.	10	25·7	27·4	306·3	247·3	1 in 180 to 1 in 35	57·2	225 to 240	..	500	2000	13,864	24·0	6½
10-in. B.L.R., Mark I., of 35 Cals.	10	27·1 28·2	30·5	343·8	283·7	zero to 1 in 25	57·2	..	..	500	2060	14,709	25·0	6¾
10-in. B.L.R., Mark II., of 30 Cals.	10	25·1	27·4	307·3	247·3	zero to 1 in 26·8	57·2	..	..	500	2000	13,864	24 0	6½
10-in. B.L.R., Mark II., of 35 Cals.	10	27·6	31·2	354·9	294·9	zero to 1 in 25	57·2	..	..	500	2100	15,285	25·8	7
10-in. B.L.R., Mark III., of 40 Cals.	10	33·4	33·3	389·0	313·4	..	75·6	..	240	500	2800	27,204	42·0	12
12-in. B.L.R., Mark I.	12	45·2	36·8	419·2	343·1	..	74·1	425	..	850	2100	25,985	30·8	9
12-in. B.L.R. Mark III., of 40 Cals.	12	52	41·8	480·1	388·1	..	91·9	..	350	850	2800	46,246	47·2	16
13-in. B.L.R., Mark I.	13	60·5	40·0	454·5	370·5	..	80·9	550	..	1100	2100	33,627	33·5	11
13-in. B.L.R., Mark II.	13	60·5	40·0	454·5	370·5	..	..		280	1100	2300	40,350	38·5	12½

NOTE.—The weight of fixed ammunition for Q.F. 4-in. and 5-in. guns is 58 and 95 lbs. respectively.

† By Tresidder's formula.

ELSWICK GUNS.

This Table is supplied by the Manufacturers.

Diameter of Bore, ins. ...	1·46			1·85			2.224			3·0			4			4·7		
do. do. m.m. ...	37			47			57			76·2			101·6			120		
Length of Bore, cals. ...	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50
do. Gun, cals. ...	42·8	47·8	52·8	43·6	48·6	53·6	43·6	48·6	53·6	41·2	46·2	51·2	41·3	46·3	51·3	41·1	46·1	51·1
Weight of Gun, tons ...	·103	·117	·13	·212	·238	·264	·366	·412	·46	·78	·88	·98	1·83	2·03	2·32	3·01	3·38	3·77
do. Projectile, lbs.	1·5	1·5	1·5	3·3	3·3	3·3	6	6	6	14	14	14	31	31	31	45	45	45
do. Battering Charge	ozs. 5·7	ozs. 6·4	ozs. 7·1	ozs. 11·6	ozs. 13·1	ozs. 14·5	lbs. 1·26	lbs. 1.42	lbs. 1.58	lbs. 3·09	lbs. 3·48	lbs. 3·88	lbs. 7·3	lbs. 8·25	lbs. 9·17	lbs. 11·9	lbs. 13·4	lbs. 14·91
Muzzle Velocity, f.-s. ...	2540	2700	2850	2450	2600	2740	2390	2540	2680	2460	2610	2750	2530	2690	2840	2690	2850	3010
Velocity at 2500 yards, f.-s.	811	831	850	957	988	1017	1058	1111	1173	1192	1260	1332	1500	1601	1677	1633	1711	1754
Muzzle Energy, f.-t. ...	67·2	76	84·5	137	155	172	238	268	299	587	661	734	1376	1555	1735	2260	2535	2830
Penetration at Muzzle, wrought iron, ins. ...	5·0	5·5	6·0	6·4	7·0	7·55	7·6	8·3	9·0	10·4	11·35	12·3	13·73	15·05	16·30	16·4	17·9	19·55
Rounds per Minute Guns should be capable of ...		30			30			25			20			15		...	10	...
Penetration Krupp Steel, 3000 yds.		...			...			...			...			...		...	...	4

Diameter of Bore, ins. ...	6			7·5			8·0			9·2			10			12		
do. do. m.m. ...	152			190·5			203			233·7			254			305		
Length of Bore, cals. ...	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50
do. Gun, cals. ...	41·55	46·55	51·55	41·75	46·75	51·75	41·75	46·75	51·75	41·85	46·85	51·85	41·65	46·65	51·65	41·7	46·7	51·7
Weight of Gun, tons ...	6·52	7·3	8·1	12·7	14·3	15·9	15·35	17·3	19·3	23·4	26·4	28·4	30·0	32·6	37·5	52·0	58·5	65·2
do. Projectile, lbs.	100	100	100	200	200	200	250	250	250	380	380	380	500	500	500	850	850	850
do. Battering Charge	lbs. 24·7	lbs. 27·9	lbs. 31	lbs. 48·4	lbs. 54·5	lbs. 60·6	lbs. 58·6	lbs. 66	lbs. 73·6	lbs. 89·1	lbs. 100·5	lbs. 111·7	lbs. 114·5	lbs. 129	lbs. 143·5	lbs. 198	lbs. 223	lbs. 248
Muzzle Velocity, f.-s. ...	2650	2810	2960	2620	2780	2930	2580	2740	2890	2580	2740	2890	2550	2710	2850	2570	2730	2880
Velocity at 2500 yards, f.-s.	1844	1950	1998	1969	2088	2147	1990	2116	2190	2055	2186	2267	2076	2213	2308	2161	2306	2405
Muzzle Energy, f.-t. ...	4890	5475	6075	9520	10720	11906	11520	13000	14480	17510	19800	22000	22545	25462	28161	39000	43900	48800
Penetration at Muzzle, wrought iron, ins. ...	21·3	23·2	25·15	26·75	29·10	31·65	28·3	31·15	33·7	32·65	35·7	38·6	35·5	39·0	41·9	42·6	46·7	50·9
Rounds per Minute Guns should be capable of ...	...	8	...	...	5	...	...	4	...	...	2	...	...	2	...	...	2	...
Penetration Krupp Steel, 3000 yds.	4½	4¾	5¼	6¼	7	7¾	7	7½	8	9	10	11	10½	11¼	12	14½	16	17

Guns from 3 to 6 inches can be fitted with either a metallic cartridge case or modified de Bange pad. The high velocities, however, are not desirable, except on rare occasions. They are, however, obtained with pressures under 17 tons.

RAPIDITY.—SOME RESULTS ACTUALLY OBTAINED.

8-in. 15·5-ton gun, single motion mechanism, 3 rounds in 28 seconds at drill; 4 rounds in 62 seconds on board cruiser "Blanco Encalada" (ammunition brought from magazine).
12-in. 46-ton B.L gun, H.M.S. Majestic, interval between 2 rounds, 1 minute 19 seconds; H.M.S. Cæsar, 1 minute 4 seconds.
12-in. B.L. gun, H.M.S. Illustrious, 6 rounds fired from one turret in 1 minute 47 seconds.
A pair of 12-in. guns, 8 rounds in 2 minutes 10 seconds.
A pair of 12-in. 51-ton guns, 5 rounds per gun fired alternately, guns started empty, 5 minutes 6 seconds.
12-in. B.L. gun, Japanese battleship Mikasa, interval between 2 rounds of same gun, 30 seconds.
Ocean (China), prize firing, 1901. 12-in. B.L., 0·58 hits per gun per minute.
Terrible " " " 6-in. Q.F., 4·25 " "
Barfleur " " 4·7-in. Q.F., 5·7 " "

VICKERS, SONS AND MAXIM'S GUNS AND MOUNTINGS.

This Table is supplied by the Manufacturers.

								Field.		Naval.			
		37 mm. 30 cal.	37 mm. 42·5 cal.	3-pdr. 50 cal.	6-pdr. 42·3 cal.	6-pdr. 50 cal.	Mountain. 75 mm. 10·7 cal.	Light. 3-inch. 23·7 cal.	Heavy. 3-inch. 29 cal.	3-in. 45 cal.	3-in. 50 cal.	4-inch. 45 cal.	4-inch. 50 cal.
Gun.	Diameter of Bore (in ins.)	1·457	1·457	1·85	2·244	2·244	2·953	3	3	3	3	4	4
	Length of Bore (in ins.)	43·5	62	92·5	95	112·2	31·6	71·05	87·2	136·6	150	180	200
	Total length of Gun (in ins.)	73·75	94	101·25	104·4	116·4	35·85	74·3	90·63	140·1	154	184·65	206·35
	Maximum pressure in Chamber, tons per sq. in.	13	14	16	15	15	8	15	15	17	17	17	17
	Weight of Charge	oz. grs. 1 110	oz. 3	oz. 13	oz. 15	lb. oz. 1 4	lb. 6·25	lb. oz. 1 1	lb. oz. 1 14	lb. oz. 4 2	lb. oz. 5 3	lb. oz. 8 2	lb. oz. 8 2
	Weight of Projectile (lbs.)	1	1·25	3·3	6	6	12·5	12·5	17·63	12·5	12·5	31	31
	Total weight of Gun, including Breech Mechanism	c. q. l. 3 2 24	c. q. l. 5 1 26	c. q. 5 2	c. q. 6 2	c. q. l. 8 0 0	c. q. l. 2 0 13	c. q. l. 4 0 0	c. q. l. 7 1 25	c. q. l. 14 3 0	c. q. l. 16 1 16	t. c. q. 1 14 1	t. c. q. 1 16 1
	Muzzle Velocity in feet per second	1800	2350	2800	2300	2500	918	1700	1700	2800	3020	2945	3020
	Muzzle Energy in foot tons	22·5	48	179·4	220	260	73	250·5	353·4	679·5	790	1865	1960
	Penetration of Wrought Iron Plate at Muzzle by Gavre's formula (ins.)	1·9	3·3	6·7	6·2	7	..	..	..	10·2	11·35	15·4	16
	Penetration of Steel Plate at Muzzle by Gavre's formula (ins.)	1·5	2·6	5·1	4·8	5·4	..	..	..	7·9	8·8	11·9	12·4
	Rounds per minute	300	300	30	23	28	14	20	20	20	20	15	15
	Penetration Krupp Steel, 3,000 yds.	..	..	..	..	..	..	..	..	..	..	..	..
Mounting.	Weight of Mounting complete with Shield	c. q. l. 4 1 10	c. q. l. 3 2 5	c. q. l. 9 0 4	c. q. 12 2	c. q. l. 12 0 0	c. q. l. 5 3 5	No Shield. Weight of equipment with 40 rds.	36 rds.	t. c. 1 6	t. c. q. 1 10 0	t. c. q. 4 4 3	t. c. q. 4 10 0
	Thickness of Shield (in ins.)	¼	no shield	¼	3/16	¼	no shield			2	2	4	4
	Weight of Shield	q. l. 3 11	,,	c. q. l. 1 0 8	c. q. 1 0	c. q. l. 1 3 9	,,	t. c. q. l. 1 8 2 5	t. c. q. 1 16 0	c. q. 9 2	c. q. l. 9 0 0	t. c. q. 2 6 0	t. c. q. 2 6 0
	Angle of Elevation	16°	13°	20°	20°	20°	26°	16°	16°	20°	20°	20°	20°
	Angle of Depression	25°	25°	20°	20°	15°	10°	8°	8°	10°	10°	7°	7°

		4·7 in. 45 cal.	4·7-in. 50 cal.	14 cm. 45 cal.	6-in. 40 cal.	6-in. 45 cal.	6-in. 50 cal.	7·5-in. 45 cal.	7·5-in. 50 cal.	8-inch. 45 cal.	9·2-in. 47 cal.	10-in. 45 cal.	12-in. 40 cal.
Gun.	Diameter of Bore (in ins.)	4·724	4·724	5·512	6	6	6	7·5	7·5	8	9·2	10	12
	Length of Bore (in ins.)	212·6	236·2	248	240	269·5	300	337·5	375	360	429·3	450	480
	Total length of Gun (in ins.)	220	243·6	257·7	249·7	279·2	309·73	349·2	386·7	372·1	442·35	462·75	496·5
	Maximum pressure in Chamber, tons per sq. in.	17	17	16·5	17	17	16	16·5	16·5	17·0	16·5	17	17
	Weight of Charge	lb. oz. 12 14	lb. oz. 12 14	lb. oz. 21 14	lb. oz. 35 5	lb. oz. 35 5	lb. 40	lb. oz. 86 8	lb. oz. 86 8	lb. 94	lb. oz. 162 4	lb. 208	lb. 309
	Weight of Projectile (lbs.)	45	45	88·19	100	100	100	200	200	250	380	500	850
	Total weight of Gun, including Breech Mechanism	t. c. q. 3 3 3	t. c. 3 6	t. c. 5 18	t. c. 6 15	t. c. q. 7 8 2	t. c. q. 7 18 3	t. c. q. 14 3 3	t. c. 16 0	t. c. q. 18 16 2	t. c. 28 1	t. c. 31 0	t. c. 50 7
	Muzzle Velocity in feet per second	2925	3000	2860	2780	2860	3000	2920	3018	2850	2900	2850	2666
	Muzzle Energy in foot tons	2670	2810	4990	5360	5670	6240	11825	12630	14080	22160	28160	41890
	Penetration of Wrought Iron Plate at Muzzle by Gavre's formula (ins.)	16·65	17·25	22·1	21·2	22·1	23·6	23·9	30·8	31·1	37	40·0	43·8
	Penetration of Steel Plate at Muzzle by Gavre's formula (ins.)	12·9	13·4	17·1	16·4	17·1	18·3	22·8	29·4	24·1	28·7	31·1	34
	Rounds per minute	12	12	10	10	10	10	8	8	6	4	3	2
	Penetration Krupp Steel, 3,000 yds.	..	4	4½	4½	4¾	5¼	7¾	8	8½	11	12	14½
Mounting.	Weight of Mounting complete with Shield	t. c. q. 6 5 0	t. c. q. 6 12 0	Depending on type of Mounting used.									
	Thickness of Shield (in ins.)	4	4										
	Weight of Shield	t. c. q. 3 18 0	t. c. q. 3 18 0										
	Angle of Elevation	20°	20°										
	Angle of Depression	7°	7°										

SCHNEIDER - CANET GUNS.

The Information in this Table is given by the Manufacturers.

Calibre, in centimètres	30·5		27·5		24		20			15			12			10			7·5		6·5		5·7		4·7	3·7
Calibre, in inches	12·0	12·0	10·8	10·8	9·45	9·45	7·9	7.9	7·9	5·9	5·9	5·9	4·7	4·7	4·7	3·9	3·9	3·9	3·0	3·0	2·5	2·5	2·25	2·25	1·85	1·45
Length, in calibres	40	45	40	45	40	45	40	45	50	40	45	50	40	45	50	40	45	50	45	50	45	50	50	60	60	60
Weight, tons	38·6	44·0	29·0	32·7	17·9	21·4	11·6	12·6	13·8	5·4	5·9	6·6	2·8	3·1	3·4	1·7	1·8	2·0	·82	·94	·57	·66	·45	·55	·31	·17
Weight of A.P. Projectile, lbs.	683	683	507	507	331	331	198	198	198	88	88	88	46	46	46	28½	28½	28½	13¼	13¼	8¾	8¾	6	6	3¼	1¾
Weight of Charge	Not	stated																								
Muzzle Velocity, ft.-secs.	3051	3248	3051	3248	3051	3248	3051	3215	3346	3018	3166	3314	3018	3150	3314	3018	3150	3314	2772	2953	2772	2953	2920	3248	3248	3150
Muzzle Energy, ft.-tons	44130	50010	32780	37130	21850	24240	12792	14210	15390	5569	6128	6709	2912	3169	3506	1846	1918	2123	707	818	467	540	354	440	238	120
Perforation of Steel at muzzle (Gavre formula)	40·5	44·7	37·4	41·2	31·4	34·6	26·4	28·4	30·3	19·2	20·4	22·2	15·1	16·2	17·5	13·0	13·8	14·9	8·7	9·5	7·5	7·9	7·1	8·3	6·5	5·1
Perforation, Wrought Iron, at muzzle, Tresidder's formula	48·0	53·0	43·3	47·6	37·7	41·2	32·0	34·3	36·6	24·4	26·0	28·2	19·6	20·7	22·6	17·3	18·4	19·8	..	..	..	..	..	..	..	..
Perforation of Krupp Steel, 3000 yards	15	16½	13	14½	10	11	8	8¾	9¼	5	5½	5¾	4	4¼	4½	..	..	4	..	..	..	..	..	..	..	..

KRUPP QUICK-FIRING GUNS, Mark 1900.

Tables supplied by Manufacturers.

LIGHT GUNS.

Calibre, in centimètres	7·5			10·5			12			15			21			24			28			30·5		
Calibre, in inches	2·95			4·13			4·72			5·91			8·27			9·45			11·02			12·01		
Total Length of Gun, in cals.	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50
Total Length, in feet	9·84	11·07	12·30	13·78	15·5	17·22	15·75	17·7	19·69	19·55	22·0	24·46	27·56	30·9	34·45	31·50	35·4	39·37	36·75	41·3	45·93	40·03	45·0	50·03
Length of Bore, in inches	108·66	123·43	138·19	153·55	174·21	194·89	175·20	199·25	222·45	218·12	247·49	276·78	305·91	347·29	388·59	350·80	398·28	445·28	409·46	464·62	519·70	445·67	505·95	565·76
Weight of Gun, in lbs.	1485·9	1700·9	1935·7	3748	4189	4740	5512	6283	7055	10582	12015	13558	29320	33290	37254	44090	50264	56443	70104	79811	89503	90610	10317	115742
Weight of Gun, in tons	0·69	0·79	0·89	1·73	1·93	2·18	2·54	2·90	3·25	4·88	5·54	6·25	13·51	15·34	17·17	20·32	23·16	26·01	32·31	36·78	41·25	41·76	47·55	53·34
Weight of Steel Projectile, in lbs.	11·5	11·5	11·5	30·86	30·86	30·86	46·30	46·30	46·30	90·39	90·39	90·39	249·1	249·1	249·1	374·8	374·8	374·8	595·2	595·2	595·2	771·6	771·6	771·6
	14·6	14·6	14·6	39·68	39·68	39·68	59·52	59·52	59·52	112·4	112·4	112·4	308·6	308·6	308·6	474·0	474·0	474·0	760·6	760·6	760·6	981·0	981·0	981·0
Weight of Charge, in lbs.	2·24	2·62	3·07	8·21	9·53	10·87	12·23	14·23	16·25	23·54	27·34	31·19	64·9	75·62	86·42	97·68	113·98	130·07	155·10	181·00	206·57	200·86	233·91	266·93
Muzzle Velocity, in ft.-secs.	2385	2572	2726	2638	2815	2992	2674	2867	3048	2651	2841	3018	2657	2848	3028	2657	2851	3031	2661	2851	3031	2654	2848	3028
	2116	2283	2418	2326	2484	2638	2359	2526	2687	2379	2546	2707	2385	2559	2720	2365	2533	2697	2352	2523	2680	2356	2526	2684
Muzzle Energy, total ft.-tons	452·7	526·0	591	1491	1697	1917	2298	2636	2982	4408	5060	5721	12198	14005	15845	18362	21105	23880	29204	33561	37917	37756	43403	490[illegible]0
Perforation through Steel, in ins.	5·97	6·69	7·24	9·8	10·75	11·73	11·58	12·8	13·94	14·65	16·14	17·60	21·06	23·23	25·39	24·33	26·89	29·37	28·74	31·73	34·65	30·6	34·76	37·99
Perforation through Iron, Tresidder's formula	8·2	9·2	10·1	13·3	14·5	16·0	15·5	17·2	18·8	19·3	21·2	23·2	27·1	30·1	32·9	31·2	24·7	37·8	36·0	40·0	43·8	39·1	43·5	46·4
Perforation Krupp Steel, 3000 yards	..	..	..	..	..	..	..	..	4	4¼	4½	5	7	7¾	8¾	8¾	10	11	11	13	15	13½	15	17

HEAVY GUNS.

Calibre, in centimètres	7·5			10·5			12			15			21			24			28			30·5		
Calibre, in inches	2·95			4·13			4·72			5·91			8·27			9·45			11·02			12·01		
Total Length of Gun, in cals.	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50
Total Length, in feet	9·84	11·07	12·30	13·78	15·5	17·22	15·75	17·7	19·69	19·55	22·0	24·46	27·56	30·9	34·45	31·50	35·4	39·37	36·75	41·3	45·93	40·03	45·0	50·03
Length of Bore, in inches	108·66	123·43	138·19	153·55	174·21	194·89	175·20	199·25	222·45	218·12	247·49	276·78	305·91	347·29	388·59	350·80	398·28	445·28	409·46	464·62	519·70	445·67	505·95	565·76
Weight of Gun, in lbs.	1860·7	2094·4	2325·8	4519·2	5115·1	5688	6724·2	7606·2	8488	12897	14661	16314	35711	40341	44972	53792	60843	67904	85544	96784	108030	110671	125003	139772
Weight of Gun, in tons	0·85	0·96	1·07	2·08	2·35	2·62	3·10	3·51	3·91	5·94	6·76	7·52	16·46	18·59	20·73	24·79	28·04	31·29	39·42	44·60	49·79	51·00	57·61	64·42
Weight of Steel Projectile, in lbs.	11·5	11·5	11·5	30·86	30·86	30·86	46·30	46·30	46·30	90·39	90·39	90·39	249·1	249·1	249·1	374·8	374·8	374·8	595·2	595·2	595·2	771·6	771·6	771·6
	14·6	14·6	14·6	39·68	39·68	39·68	59·52	59·52	59·52	112·4	112·4	112·4	308·6	308·6	308·6	474·0	474·0	474·0	760·6	760·6	760·6	981·0	981·0	981·0
Weight of Charge, in lbs.	2·43	2·78	3·15	8·71	10·12	11·53	13·01	15·10	17·22	24·91	28·88	33·04	68·78	80·03	91·49	103·84	120·59	137·79	165·12	191·80	218·70	213·40	247·58	282·85
Muzzle Velocity, in ft.-secs.	2484	2661	2822	2723	2910	3094	2763	2976	3159	2743	2949	3133	2749	2953	3140	2746	2956	3143	2749	2959	3140	2746	2953	3140
	2205	2362	2507	2402	2566	2730	2438	2625	2785	2457	2644	2808	2467	2654	2822	2441	2628	2795	2431	2618	2776	2434	2618	2785
Muzzle Energy, total ft.-tons	490·5	562·8	633·8	1588	1814	2049	2452	2840	3204	4711	5450	6151	13037	15070	17039	19588	22702	25655	31205	36142	40725	40338	46695	52729
Perforation through Steel, in ins.	6·39	7·01	7·64	10·28	11·26	12·32	12·13	13·50	14·69	15·36	17·01	18·54	22·13	24·49	26·73	25·47	28·31	30·87	30·12	33·47	36·42	32·4	36·65	40·08
Perforation through Iron, Tresidder's formula	8·7	9·7	10·6	13·9	15·4	16·8	16·3	18·1	19·8	20·1	22·3	24·5	28·5	31·8	34·6	32·7	36·3	39·8	37·6	42·2	46·5	41·0	45·8	50·1
Perforation Krupp Steel, 3000 yards	..	..	..	..	..	..	..	4	4½	4½	4¾	5¼	7½	8¼	9	9	10½	12	12	14	16	14	16	18½

NOTE.—Every one of the Guns included in the Tables has been actually constructed and can be supplied on order.

KRUPP QUICK-FIRING GUNS, Mark 1901.

Tables supplied by Manufacturers.

LIGHT GUNS.

Calibre, in centimètres	7·5			10·5			12			15			21			24			28			30·5		
Calibre, in inches	2·95			4·13			4·72			5·91			8·27			9·45			11·02			12·01		
Total Length of Gun, in cals.	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50
Total Length, in feet	9·84	11·07	12·30	13·78	15·5	17·22	15·75	17·7	19·69	19·55	22·00	24·44	27·56	30·9	34·45	31·50	35·4	39·37	36·75	41·3	45·93	40·03	45·0	50·03
Length of Bore, in inches	108·66	123·43	138·19	153·55	174·21	194·89	175·20	199·25	222·45	218·12	247·49	276·78	305·91	347·29	388·59	350·80	398·28	445·28	409·46	464·62	519·70	445·67	505·95	565·76
Weight of Gun, in lbs.	1488	1711	1936	2748	4189	4740	5512	6283	7055	10582	12015	13558	29321	33290	37254	44090	50264	56443	70104	79811	89503	90610	103174	115742
Weight of Gun, in tons	0·68	0·79	0·89	1·73	1·93	2·18	2·54	2·90	3·25	4·88	5·54	6·25	13·51	15·34	17·17	20·32	23·16	26·01	32·31	36·78	41·25	41·76	47·55	53·34
Weight of Steel Projectile, in lbs.	11·5	11·5	11·5	30·86	30·86	30·86	46·30	46·30	46·30	90·39	90·39	90·39	249·1	249·1	249·1	374·8	374·8	374·8	595·2	595·2	595·2	771·6	771·6	771·6
	14·6	14·6	14·6	39·68	39·68	39·68	59·52	59·52	59·52	112·4	112·4	112·4	308·6	308·6	308·6	474·0	474·0	474·0	760·6	760·6	760·6	981·0	981·0	981·0
Weight of Charge, in lbs.	2·77	3·12	3·54	9·30	10·83	12·34	13·93	16·11	18·43	26·67	30·95	35·40	74·07	85·74	97·97	111·23	128·97	147·27	176·59	205·25	234·57	228·61	264·99	303·13
Muzzle Velocity, in ft.-secs.	2690	2890	3068	2835	3035	3232	2900	3097	3291	2877	3068	3264	2884	3081	3271	2884	3081	3268	2887	3081	3271	2881	3074	3268
	2388	2566	2723	2500	2674	2851	2559	2730	2904	2579	2753	2927	2592	2766	2940	2562	2736	2907	2552	2723	2894	2552	2726	2897
Muzzle Energy, total ft.-tons	576	665	749	1720	1968	2236	2701	3079	3475	5183	5905	6680	14360	16361	18491	21589	24622	27817	34367	39143	44242	44371	50349	57182
Perforation through Steel, in ins.	7·13	7·91	8·58	10·87	11·97	13·15	12·99	14·25	15·59	16·46	18·03	19·69	23·66	26·02	28·35	27·32	30·0	32·68	32·28	35·43	38·62	35·36	38·82	42·36
Perforation through Iron, Tresidder's formula	9·9	11·0	11·7	14·7	16·3	18·0	17·6	19·4	21·0	21·8	23·9	26·2	30·7	33·5	37·0	34·0	37·6	42·1	40·7	44·5	48·9	44·2	48·6	53·3
Perforation Krupp Steel, 3000 yards	..	..	..	..	..	..	..	4	4½	4½	5	5½	7½	8¾	10	9½	11	13	13	15	17	15½	17½	19

HEAVY GUNS.

Calibre, in centimètres	7·5			10·5			12			15			21			24			28			30·5		
Calibre, in inches	2·95			4·13			4·72			5·91			8·27			9·45			11·02			12·01		
Total Length of Gun, in cals.	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50	40	45	50
Total Length, in feet	9·84	11·07	12·30	13·78	15·5	17·22	15·75	17·7	19·69	19·55	22·00	24·44	27·56	30·9	34·45	31·50	35·4	39·37	36·75	41·3	45·93	40·03	45·0	50·03
Length of Bore, in inches	108·66	123·43	138·19	153·55	174·21	194·89	175·20	199·25	222·45	218·12	247·49	276·78	305·91	347·29	388·59	350·80	398·28	445·28	409·46	464·62	519·70	445·67	505·95	565·76
Weight of Gun, in lbs.	1861	2094	2326	4519	5115	5688	5842	6724	7606	11244	12897	14661	31080	35711	40341	46741	53792	60843	74514	85544	96784	96343	110671	125003
Weight of Gun, in tons	0·85	0·96	1·07	2·08	2·35	2·62	2·70	3·10	3·51	5·18	5·94	6·76	14·32	16·46	18·59	21·54	24·79	28·04	34·34	39·42	44·60	44·40	51·00	57·61
Weight of Steel Projectile, in lbs.	11·5	11·5	11.5	30·86	30·86	30·86	46·30	46·30	46·30	90·39	90·39	90·39	249·1	249·1	249·1	374·8	374·8	374·8	595·2	595·2	595·2	771·6	771·6	771·6
	14·6	14·6	14·6	39·68	39·68	39·68	59·52	59·52	59·52	112·4	112·4	112·4	308·6	308·6	308·6	474·0	474·0	474·0	760·6	760·6	760·6	981·0	981·0	981·0
Weight of Charge, in lbs.	2·99	3·35	3·76	10·16	11·63	13·18	15·10	17·80	20·30	28·88	34·17	39·02	80·03	94·71	108·10	120·60	142·41	162·48	191·80	226·41	258·60	248·02	292·77	334·0
Muzzle Velocity, in ft.-secs.	2876	2999	3123	2949	3150	3337	2933	3146	3353	2910	3120	3320	2917	3130	3330	2917	3130	3330	2920	3133	3330	2917	3127	3330
	2664	2775	2885	2602	2779	2946	2588	2776	2959	2608	2799	2979	2621	2812	2992	2595	2782	2963	2582	2769	2949	2585	2772	2953
Muzzle Energy, total ft.-tons	620	703	795	1862	2123	2391	2762	3182	3611	5308	6109	6922	14683	16926	19168	22121	25461	28849	35174	40499	45888	45501	52277	59280
Perforation through Steel, in ins.	7·52	8·23	8·98	11·50	12·68	13·74	13·23	14·61	16·02	16·73	18·47	20·16	24·06	26·61	29·06	27·80	30·71	33·58	32·84	36·34	39·65	35·98	39·76	43·51
Perforation through Iron, Tresidder's formula	10·5	11·3	12·0	15·6	17·4	19·0	17.8	19·8	21·6	22·0	23·8	26·8	31·3	34·4	38·0	34·8	38·8	43·4	41·6	45·1	50·2	45·2	48·8	54·2
Perforation Krupp Steel, 3000 yards	..	..	..	..	..	..	4	4¼	4¾	4¾	5¼	5¾	7¾	9	10	10	11½	13½	13½	15½	17½	16	18½	20

NOTE.—Every one of the guns included in the Tables has been actually constructed and can be supplied on order.

BETHLEHEM STEEL CO.

ORDNANCE.

This Table is supplied by the Manufacturers.

NATURE OF GUN.	Calibre in inches.	Calibre in cms.	Length of bore.	Length of gun.	Weight of gun.	Charge of smokeless powder.	Weight of projectile.	Muzzle velocity.	Muzzle energy.	Perforation at muzzle of U.S. standard face-hardened armour by capped A.P. projectiles.
			cals.	cals.	lbs.	oz.	lbs.	foot-seconds.	foot-tons.	
1-pr.	1·457	3·7	46·4	50	120	3	1	2300	37	
3-pr.	1·851	4·7	46	50	550	19·5	3	2600	142	2
6-pr.	2·244	5·8	50	54	960	22·5	6	2400	240	2·5
3-in. Q.F., Light	3	7·62	27	33	720	22	15	1850	345	3·5
3-in. Q.F.	3	7·62	50	51·4	1900	lbs. 5	15	2800	8064	4·4
4-in. Q.F.	4	10·16	39·4	41·1	tons. 1·5	8	33	2250	345	3·9
4-in. Q.F.	4	10·16	50	51	2·6	15	33	2900	1924	6·8
4·7-in. Q.F.	4·7	12	48·5	50	3·9	15	45	2500	2445	7·2
5-in. Q.F., No. 1 ‡	5	12·7	45·1	46·3	3·4	9·5	50	2200	2180	7·0
5-in. Q.F., No. 2	5	12·7	45·1	45·9	3·4	14	55	2600	2577	7·1
5-in. Q.F., No. 3 §	5	12·7	50	51·1	4·6	27	50	2900	3207	7·7
6-in. Q.F., No. 1 §	6	15·24	41	42·3	6·1	16	100	2200	3355	7·5
6-in. Q.F., No. 2	6	15·24	44	45	7·1	28	100	2500	4333	8·8
6-in. Q.F., No. 3	6	15·24	50	51·5	7·9	46	100	2900	5830	10·6
8-in. Q.F., No. 1	8	20·32	45	46·5	16·6	90	250	2500	10,833	13
8-in., No. 2 ‡	8	20·32	32	35	9·6	83	300	2300	10,528	13·2
10-in., No. 1 ‡	10	25·4	34·7	36·7	30	140	575	2300	21,086	17·2
10-in., No. 2	10	25·4	40	41·4	32	140	500	2500	21,665	17·5
10-in. Shell Gun	10	25·4	28·2	30	13	100	400	2200	13,420	13
12-in. ‡	12	30·48	35·3	36·9	51	240	1000	2300	36,671	21·7
12-in. Mortar ‡ ‖	12	30·48	10	11·76	13	50	800	1325	9736	9·5
18-in. Shell Gun	18	45·72	28	29·3	60	400†	2000	2250*	70,185	25·3

Guns from 3 inches to 6 inches fitted with either a metallic cartridge case or a Debange pad.

* This velocity is reached, allowing the usual factor of safety for the gun. With an 1830-lb. explosive shell (500 lbs. of wet gun-cotton), a velocity of 1980 foot-seconds was reached with 8·2 tons pressure.

† 75 per cent. cellulose, 25 per cent. nitro-glycerine.

‡ U.S. Army type.

§ U.S. Navy type.

‖ These mortars have been found very accurate at ranges up to 10,000 yards, when fired at obscured targets representing a ship's deck.

Table Relating to Conversion of Measures.

Length.

Metric to English. — English to Metric.

I. Mètres.	II. Yards.	III. Feet.	IV. Inches.	V. Yards.	VI. Mètres.	VII. Feet.	VIII. Mètres.	IX. Inches.	X. Centimètres.
1	1·0936	3·2809	39·37	1	0·91438	1	0·30479	1	2·5400
2	2·1873	6·5618	78·74	2	1·82877	2	0·60959	2	5·0799
3	3·2809	9·8427	118·11	3	2·74315	3	0·91438	3	7·6199
4	4·3745	13·1236	157·48	4	3·65753	4	1·21918	4	10·1598
5	5·4682	16·4045	196·85	5	4·57192	5	1·52397	5	12·6998
6	6·5618	19·6854	236·22	6	5·48630	6	1·82877	6	15·2397
7	7·6554	22·9663	275·60	7	6·40068	7	2·13356	7	17·7797
8	8·7491	26·2472	314·97	8	7·31507	8	2·43836	8	20·3196
9	9·8427	29·5281	354·34	9	8·22945	9	2·74315	9	22·8596

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus, find the number

of yards in 2354 mètres (see cols. I. & II.).	of feet in 12·4 mètres (see cols. I. & III.).	of inches in 30·5 centimètres (see cols. I. & IV.). Note, 1 m.=100 cm.	of mètres in 1026 yards (see cols. V. & VI.).	of mètres in 1742 feet (see cols. VII. & VIII.).	of centimètres in 17·72 ins. (see cols. IX. & X.)
mètres. yards. 2000=2187·3 300= 328·09 50= 54·68 4= 4·37	mètres. feet. 10 =32·809 2 = 6·562 0·4= 1·312	cms. inches. 30·0=11·811 ·5= ·197	yards. mètres. 1000=914·38 20= 18·29 6= 5·49	feet. mètres. 1000=304·79 700=213·36 40= 12·19 2= 0·61	inches. cms. 10·0 =25·400 7·0 =17·780 0·7 = 1·779 ·02= ·051
∴ 2354=2574·44	∴ 12·4=40·683	∴ 30·5=12·008	∴ 1026=938·16	∴ 1742=530·95	∴ 17·72=45·009

Note.—A ready way of approximately converting all French measures into English inches is to multiply by 4 and apply the decimal point by common sense—Thus for a 15-cm. gun; 15 × 4 = 60. Now this Calibre cannot be 60 inches, nor can it be 0·6 inch; therefore it must be 6 inches. (The exact value is 5·906 in.)

Weight.

Metric to English. — English to Metric.

I. Kilo-grammes.	II. Tons.	III. Pounds Avoirdupois.	IV. Grains Troy.	V. Tons.	VI. Milliers.	VII. Pounds Avoir-dupois.	VIII. Kilo-grammes.	IX. Grains. Troy.	X. Gramme.
1	·000984	2·2046	15432·3	1	1·016	1	0·4536	1	·0648
2	·001968	4·4092	30864·7	2	2·032	2	0·9072	2	·1296
3	·002953	6·6139	46297·0	3	3·048	3	1·3608	3	·1944
4	·003937	8·8185	61729·4	4	4·064	4	1·8144	4	·2592
5	·004921	11·0231	77161·7	5	5·080	5	2·2680	5	·3240
6	·005905	13·2277	92594·1	6	6·096	6	2·7216	6	·3888
7	·006889	15·4323	108026·4	7	7·112	7	3·1751	7	·4536
8	·007874	17·6370	123458·8	8	8·128	8	3·6287	8	·5184
9	·008858	19·8416	138891·1	9	9·144	9	4·0823	9	·5832

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus, find the number

of tons in 35 milliers (see cols. I. & II. Note, 1000 kg. =1 millier).	of pounds in 56·3 kilo-grammes. (see cols. I. & III.).	of grains in 120 grammes (see cols. I. & IV. Note, 1000 grms. = 1 kg.)	of milliers in 38 tons (see cols. V. & VI.).	of kilogrammes in 68 pounds (see cols. VII. & VIII).	of grammes in 85 grains (see cols. IX. & X.).
milliers. tons. 30 = 29·53 5 = 4·92	kgrms. lbs. 50 =110·231 6 = 13·228 0·3= ·661	grammes. grains. 100=1543·23 20= 308·65	tons. milliers. 30 = 30·48 8 = 8·13	lbs. kgs. 60 = 27·216 8 = 3·629	grains. grammes. 80 = 5·184 5 = 0·324
∴ 35 = 34·45	∴ 56·3=124·120	∴ 120=1851·88	∴ 38 = 38·61	∴ 68 = 30·845	∴ 85 = 5·508

Note.—7000 grains troy = 1 pound avoirdupois.

PRESSURE.

Metric to English.			English to Metric.				Atmospheric to English.		English to Atmospheric.	
I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.
Kilogrammes per square centimètre.	Pounds per square inch.	Tons per square inch.	Pounds per square inch.	Kilogrammes per square centimètre.	Tons per square inch.	Kilogrammes per square centimètre.	Atmospheres.	Tons per square inch.	Tons per square inch.	Atmospheres.
1	14·223	·00635	1	·07031	1	157·49	1	·00656	1	152·38
2	28·446	·01279	2	·14062	2	314·99	2	·01313	2	304·76
3	42·668	·01905	3	·21003	3	472·48	3	·01969	3	457·14
4	56·891	·02540	4	·28124	4	629·97	4	·02625	4	609·52
5	71·114	·03175	5	·35155	5	787·47	5	·03281	5	761·91
6	85·337	·03810	6	·42186	6	944·96	6	·03938	6	914·29
7	99·560	·04445	7	·49217	7	1102·45	7	·04594	7	1066·67
8	113·783	·05080	8	·56248	8	1259·95	8	·05250	8	1219·05
9	128·005	·05715	9	·63279	9	1417·44	9	·05906	9	1371·43

Note.—One atmosphere is taken to be 14 7 lbs. per square inch.

Explanation.—To convert any number from one measure to the other, take the value of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus, find the number

of pounds per square inch in 32·1 kilogrammes per square centimètre (see cols. I. & II.).	of tons per square inch in 3210 kilogrammes per square centimètre (see cols. I. & III.).	of kilogrammes per square centimètre in 15 lbs. per square inch (see cols. IV. & V.).	of kilogrammes per square centimètre in 18 3 tons per square inch (see cols. VI. & VII.).	of tons per square inch in 3254 atmospheres. (see cols. VIII. & IX.).	of atmosphere in 14·6 tons per square inch (see cols. X. & XI.).
kgs. per sq. cm. = lbs. per sq. in.	kgs. per sq. cm. = tons per sq. in.	lbs. per sq. in. = kgs. per sq. cm.	tons per sq. in. = kgs. per sq. cm.	atmospheres. = tons per sq. inch.	tons per sq. in. = atmospheres.
30 = 426·68	3000 = 19 05	10 = ·7031	10 = 1574 9	3000 = 19·69	10 = 1523·8
2 = 28·45	200 = 1·27	5 = ·3516	8 = 1259·95	200 = 1·31	4 = 609·5
0·1 = 1·42	10 = ·06		0 3 = 47·25	50 = ·33	0·6 = 91·4
				4 = ·03	
32·1 = 456·55	∴ 3210 = 20·38	∴ 15 = 1·0547	∴ 18 3 = 2882·10	∴ 3254 = 21·36	∴ 14 6 = 222·7

ENERGY.

Metric to English.		English to Metric.	
I.	II.	III.	IV.
Mètre-tons.	Foot-tons.	Foot-tons.	Mètre-tons.
1	3·2291	1	0·3097
2	6·4581	2	0·6194
3	9·6872	3	0·9291
4	12·9162	4	1·2388
5	16·1453	5	1·5484
6	19·3743	6	1·8581
7	22·6034	7	2·1678
8	25·8324	8	2·4775
9	29·0615	9	2·7872

A mètre-ton is termed a "dinamode" in Italy.

Explanation.—To convert any number from one measure to the other, take the values of the different multiples of 10 by shifting the position of the decimal point, and add together. Thus find the number

of foot-tons in 4367 mètre-tons (see cols. I. & II.).	of mètre-tons in 3592 foot-tons (see cols. III. & IV.).
mètre-tons. = foot-tons.	foot-tons. = mètre-tons.
4000 = 12916·2	3000 = 929·1
300 = 968·72	500 = 154·84
60 = 193·74	90 = 27·87
7 = 22·60	2 = ·62
∴ 4367 = 14101·26	∴ 3592 = 1112·43

PERFORATION THROUGH IRON AND STEEL WITH THE FACE NOT HARDENED.

To obtain perforation through steel equivalent to a given perforation through iron, and *vice versa*.

1 inch steel = $1\frac{1}{4}$ inches iron ;

that is, 4 inches steel = 5 inches iron.

Thus, given 9·4 inches perforation through iron,

$$9 \cdot 4 \times \frac{4}{5} = 7 \cdot 52 \text{ inches steel ;}$$

or, given 5·2 inches steel,

$$5 \cdot 2 \times \frac{5}{4} = 6 \cdot 5 \text{ inches iron.}$$

PART IV.

STATISTICS, OFFICIAL STATEMENTS AND PAPERS.

Statement Explanatory of Navy Estimates, 1903-4.

The Estimates for 1903-4 amount to £34,457,000, as opposed to £31,255,000 for the current year.

Administration.

The expansion and reorganisation of the Admiralty mentioned in my memorandum of last year is steadily proceeding on the principles therein laid down. The question of the organisation of the Controller's Department was referred to a Committee presided over by Admiral Sir Charles Fane, K.C.B., the report of which was of great assistance to the Board. As the result, the Controller's Department as a whole has been strengthened; the Controller himself has received a Naval Assistant, and in that and other ways has been relieved of the burden of details, responsibility for which has been entrusted to his subordinates. In the sphere of work of the Director of Naval Construction a new sub-branch has been formed under an officer, styled the Superintendent of Construction Accounts and Contract Works, whose position towards the Director of Naval Construction is analogous to that of the Superintendent of Naval Ordnance Stores to the Director of Naval Ordnance. The result is that while the Director of Naval Construction will be freer than he has ever been to devote his whole energies to the work of designing ships, and of generally supervising their construction in accordance with his designs, the duty of the detailed superintendence of contract and financial work connected with construction will devolve on this new officer. The Department of the Engineer-in-Chief has also been strengthened, and so better equipped to meet the constantly increasing strain upon it. The Engineer-in-Chief is not only the responsible adviser of the Board of Admiralty on all questions of naval engineering, but he is also the official head of the engine-room branch of the *personnel* of the Navy. These two duties do not seem to me to be necessarily connected, and in view of the constantly increasing importance of what are really the functions of a Director of Naval Engineering, the time will, in my opinion, come when it will be more convenient to separate them.

As already announced, the Board have decided to strengthen their equipment for dealing with specially difficult problems of marine engineering by asking a small committee of the highest recognised authorities in the country to consent to meet on occasion, when summoned by the Controller, and give them the benefit of their advice on any question submitted to them. The Naval Ordnance Store Department, reorganised as an integral sub-branch of the Naval Ordnance Department, as mentioned in my last memorandum, has worked admirably during the past year. The policy of separation of naval from military ordnance stores is being steadily pursued. It has been for some time complete at the home ports; it was finally effected at Malta last year; it will be carried out this year at Bermuda; and it is under present consideration in relation to Hong Kong. The representation of the Navy on the Ordnance Committee has been strengthened by the addition of an officer of the Royal Marine Artillery, and the Rear-Admiral Vice-President of the Ordnance Committee has become an Associate Member of the Explosives Committee.

The excellence of the organisation of the Transport Department of the Admiralty has been proved by the readiness with which that department expanded itself to deal successfully with the vast calls made upon it in connection with the late war. As a result of the experience gained during the war the department has been permanently strengthened and its organisation slightly modified.

The establishment of the Naval Intelligence Department has been permanently increased during the past year by the addition of two naval officers of the executive branch, one marine officer, and a civil servant, and temporarily by the addition of one naval officer of the executive and another of the engineer branch, and of another marine officer. I have noticed some misconception in respect of this department which I should like to correct. It seems to be a prevalent idea that either the Board of Admiralty or the Treasury have crippled it by refusing it the funds wherewith to expand, and frequent comparisons are drawn between the magnitude of the work which must fall to it and the size of its staff and that of the staffs of various foreign nations. I am glad of this opportunity of stating categorically that this conception of the attitude of the Treasury has no foundation in fact, and that it is equally erroneous to suppose that the Board of Admiralty do not give their whole support to the Director of Naval Intelligence in his all-important task. The fact is that the department is steadily expanding, and will continue to expand, and it will have every assistance in its expansion which His Majesty's Government can give it; but I am not prepared to

admit that the only measure of the value of the work of a department is the size of its staff, or that an exact comparison is possible between the staff of our Intelligence Department and that of a foreign nation.

As is well known, the organisation of the war mobilisation of the Fleet is part of the duty of the Naval Intelligence Department, and this work is being constantly revised; but the full scheme of the Board includes also the elaboration of the war organisation of the Admiralty itself under the responsibility of the Secretary of the Admiralty, and aims at securing that each department of the Admiralty shall, at the same time as the Fleet is mobilised for war, be able to mobilise itself immediately for war administration, and that as little as possible shall be left for decision when war breaks out. Every department will expand automatically and know exactly how to carry on without referring to the Board for instructions.

The large programme of works which it has been necessary to undertake to meet naval requirements has involved a rapid increase in the staff of the Works Department, and it has been difficult to obtain sufficient entries of competent civil engineers to keep it up to its proper strength. The conditions of entry and service have been investigated by a committee, and on their recommendation certain changes are being made which should render the Works Department service sufficiently attractive to secure the entry by competitive examination of the best class of young men who are entering the engineering profession.

Personnel.

In my statement of last year I recognised my special responsibility for devising a remedy for the future for the absence from the Flag List of a due proportion of younger officers, and the Board have already taken steps in this direction. At first sight the question appears a simple one; it is, however, one of the most complicated that can be conceived, because any change in any direction affects the career of such large numbers of officers, and, unless fully thought out in advance, is liable to produce unexpected and undesired results. To assist them in elucidating this complicated problem the Board appointed a committee consisting of Viscount Goschen, Admiral Sir Michael Culme Seymour, Bt., G.C.B., Sir Francis Mowatt, G.C.B., Permanent Secretary of the Treasury, Rear-Admiral E. S. Poë, M.V.O., Captain Sir G. Warrender, Bt., R.N., C.B., Sir Richard Awdry, K.C.B., Accountant-General of the Navy. This committee, to which and especially to its chairman, Lord Goschen, the Board are deeply indebted, have presented their report. As this report has only just been received, the Board have not yet had the opportunity

of considering it, and I must reserve for a future occasion an examination of the question in detail.

I have again to emphasize in the strongest way the value of the war course at Greenwich for the senior officers of the Navy as conducted by the captain of the college. The more the work of that course proceeds the more strongly emphasized is the necessity for its existence. It is not all officers who have turned their minds to the consideration of the many problems which will confront them in war, and the more this course stimulates the study of naval problems by officers of every rank the better it will be for the Navy.

I have so recently laid before Parliament, in a separate memorandum, the new scheme of entry and training of naval officers, that I have little at present to add to it, except to repeat what was stated in a footnote—that the Board are well aware that the age at which the medical and accountant officers of the Navy reach their relative rank requires readjustment. The Board have adopted it as a principle that the age at which the relative rank is attained by the different branches of the service should be more closely equalised, and the details are now being worked out. New and important regulations affecting the Medical Branch and the Naval Chaplains respectively, details of which will be found in the appendix, have come into operation during the course of last year. The new departure of sending the fourth term cadets to sea in the Isis has been an unqualified success. Not only has the time at sea been in no way detrimental to their studies, but the practical instruction has been such that they have been reported as already fitted to perform their duties as Midshipmen on joining the Fleet from the Isis.

The detailed plan for the future training of the men of the Navy is being steadily elaborated. It will be first of all introduced in the Portsmouth command, and will provide, among other things, that in the future an able seaman, before receiving his rating as such, must possess some mechanical knowledge and a fair knowledge of the simpler duties of the stokehold. On the same principles all obsolete instruction will be eliminated from the course on the boys' training-ships, and elementary instruction in the use of mechanical appliances substituted for it. Much more time will also be devoted than hitherto to the instruction of the boys in gunnery. In old days the physical training of the seamen was provided for in the best possible way by their work on the masts and yards. This is no longer the case, and it has been necessary to provide an adequate physical training by other means. Some particulars as to the gymnastic training which is being organised will be found in the appendix.

The numbers voted for the current year were 122,500 officers and

men active service ratings. This establishment will undoubtedly have been fully reached by the end of the financial year, and for next year the numbers proposed are 127,100. The increase will consist of the following ranks and ratings:—

Officers	262
Warrant officers	95
Seamen	1637
Artisans and electricians	95
Engine-room artificers	200
Stokers	1830
Miscellaneous	411
Boys (Artificers, Shipwrights, etc.) . .	70
Total	4600

In accordance with the recommendations of the Committee on Naval Reserves, presided over by Sir Edward Grey, it is proposed that 625 of the stokers and 375 of the seamen should be non-continuous service men. Legislation will be proposed to Parliament to enable the Board of Admiralty to make it a condition of enlistment for non-continuous service that after a limited period of service in the Fleet the men so enlisted should join the Royal Fleet Reserve for the unexpired portion of twelve years. The Board owe a deep debt of gratitude to Sir Edward Grey and his colleagues for their work; the recommendations of the Committee will assuredly be of great value to the Board. I trust that as the result of the work of this Committee a principle and standard in respect of the manning of the Navy will be adopted by the Board which will receive the seal of the concurrence of Parliament; but, in view of the constant demands that are made in various quarters that additional ships should be placed in commission, I wish to lay stress on the fact that the number of the active service ratings must continue to increase disproportionately to the growth of the reserves, unless a fairly constant ratio is observed between the ships in commission and the ships in reserve. On mobilisation for war each freshly-commissioned ship will receive a crew drawn partly from the active service ratings and partly from the reserves, in carefully approved proportions; but in time of peace a ship in commission can only be manned by active service ratings, the reserves—except for training in ships of the Home Fleet—not being available for this purpose. It consequently follows that at each additional commissioning in time of peace either the establishment of the active service ratings must be increased, or the number of active service ratings required to give the proper

proportion to reserves will be deficient at the moment of mobilisation for war.

The Calypso, fitted as a drill-ship, has been stationed at St. John's, and the Board are glad to be able to announce that with the assistance of the Colonial Government the Newfoundland branch of the Royal Naval Reserve is fairly started. It at present numbers some 180 men.

I have frequently expressed the views of the Board of Admiralty as to the overwhelming importance of proficiency in gunnery, and I am able to state positively that the whole of the Navy are striving, both officers and men, to reach the highest standard. It has recently been decided to award a medal (carrying with it a bonus), to be worn on the right breast, to the captains of the guns, seamen or marines, in each ship, who are judged by the Captain to be the best shot in that ship during the year with each nature of gun, conditionally on their attaining a *minimum* standard to be approved by the Admiralty. Gunnery is often spoken of as merely a question of money, but I entirely demur to this view. I do not believe that any amount of money prizes would stimulate the Fleet to as great exertions in this matter as their patriotism and sense of honour and duty are doing now. To make it a question of money is to lower the standard of duty, and in the end to deteriorate the proficiency of the ship for the purposes of war. The inevitable tendency of wholesale money prizes is to create an artificial atmosphere of competition as unlike as possible to the reality of war. Further, I must point out that the conditions under which different ships shoot differ so widely that there would be grave risk of injustice and of consequent discouragement if any attempt were made to single out one ship in the year as the best shooting ship in the Navy, or one man as the best shot in the Navy. On the other hand, it is quite possible to judge which man in each ship is the best shot with each nature of gun, and to mark him out for honour accordingly as the Board have done. The fact is that excellence in gunnery is a question only of endeavour and of a sound system of training.

Construction and Reconstruction, and Repairs.

All the money voted for the year 1902–3 will have been earned and spent by March 31. The amount proposed in the Estimates for 1903–4 for New Construction is £10,137,000, of which £1,150,000 will be devoted to the commencement of new ships. The corresponding amounts for the current year were £9,058,000 and £700,000 respectively. Since my last statement was presented to Parliament the Board have considered carefully the report of the Committee on

the past arrears in shipbuilding; they believe that the light shed on the subject by that report has been of much value, and they have accordingly taken every opportunity of profiting by its recommendations. Between April 1, 1902, and March 31, 1903, inclusive, the following ships will have been completed and passed into the Fleet Reserve:—

Battleships: London, Venerable, Russell, Montagu.

First-class Armoured Cruisers: Bacchante, Good Hope, Drake, Leviathan, King Alfred.

Sloops: Odin, Merlin.

4 *Destroyers,* 3 *Torpedo Boats,* 6 *Submarines.*

Repair Ship: Assistance.

Distilling Ship: Aquarius.

On April 1, 1903, there will be under construction:—11 battleships, 19 armoured cruisers, 2 second-class cruisers, 4 third-class cruisers, 4 scouts, 2 sloops, 19 destroyers, 8 torpedo-boats, and 3 submarines; and it is expected that between April 1, 1903, and March 31, 1904, inclusive, the following ships will have been completed and passed into the Fleet Reserve:—6 battleships, 11 armoured cruisers, 1 second-class cruiser, 2 sloops, 4 destroyers, 8 torpedo boats, and 3 submarines. It is proposed to commence during the financial year 1903–4:—3 battleships, 4 first-class armoured cruisers, 3 third-class cruisers, 4 scouts, 15 destroyers, and 10 submarines.

It will also be necessary to build a new Admiralty yacht, the old Enchantress, which has been going for nearly forty years, being no longer seaworthy; another shallow-draft river steamer for the China Station, and two vessels for Naval Reserve work.

Much progress will have been made by March 31 next in the policy of reconstruction, announced in my statement of last year, as will be seen from the following list: Completed.—*Battleships* (Royal Sovereign class)—Empress of India, Resolution, Revenge, Royal Oak. *First-class cruiser*—Powerful. *Second-class cruisers* (Talbot class)—Doris, Venus, Dido, Isis. In hand.—*Battleships*—Barfleur, Centurion. *First-class cruiser*—Terrible.

Owing to the great pressure of work in the dockyards it has been decided to allow the contractors who are building the ships to complete them in all respects ready for commission, by which means all the shipbuilding firms who construct war vessels will gain further experience and be better prepared to undertake naval work. The completion of these ships will entail an increase of the Controller's naval staff, in order to ensure that the ships are fitted in every way in accordance with the usual custom of the service, and to avoid any alterations or additions at the dockyards after final delivery. The

policy of relieving the congestion of repairs in the dockyards by sending ships to be repaired by the private firms which built them has been largely followed, and the Board propose to continue the policy, which, I am convinced, is for the advantage of the Navy.

The subject of subsidised merchant cruisers has been brought to the front by the reports of the inter-departmental Committee, over which Lord Camperdown presided, and of the committee of the House of Commons, of which Mr. Evelyn Cecil, M.P., was chairman, and by the creation of the great American shipping combination. Subsidised merchant cruisers can never be a substitute for His Majesty's cruisers, but they will have their special uses. It did not seem to the Board right that any ship should be in existence which, in case of war, no ship at the disposal of the Board could reasonably expect to catch, and they were accordingly glad when, for this reason, among others, His Majesty's Government decided, should Parliament approve, to give such a subsidy to the Cunard Company as will enable them to build two steamers, of superior speed to anything afloat, which will be entirely at the disposal of the Admiralty in time of war. This, in the opinion of the Board, was definitely the most economical method of effectually meeting a special need. Before the current agreement in respect of subsidised merchant cruisers with the various steamship companies expires, two years hence, the Board will have to reconsider their policy in respect of ships of no special speed in the light of the reports of the two committees already mentioned.

Since my last statement the Boiler Committee have presented their final report on the questions referred to them, and I have announced that the policy of the Board, until further experience has been gained with the various types of water-tube boilers now being placed in His Majesty's ships, is to adhere to a combination of four-fifths water-tube of certain types recommended by the committee, and one-fifth cylindrical boilers. I have never attempted to minimise the difficulties which have been caused to the Fleet by the adoption of Belleville boilers; these difficulties were due partly to the faulty manufacture of the first series of such boilers, partly to the great increase of pressure, and partly to the initial want of training of the *personnel* in their management; but they were mainly *ejusdem generis* with those which the Navy had for years to contend with on the first adoption of the various kinds of boilers which preceded them. As each of the earlier Belleville boiler ships comes in for refit on the termination of her commission, she is being placed in thorough repair and made absolutely efficient for service. Owing to the experience gained, no further difficulties ought to occur with

these ships; and although the Board agree with the Boiler Committee in considering other types of water-tube boilers to be much preferable, they also share the Committee's view that to replace these boilers by others in the ships which already have them would be an unjustifiable, because an unnecessary, expense. I warned Parliament that the cost of repairs for the boilers of the earlier ships fitted with water-tube boilers would prove to be very heavy, but at the same time I pointed out that the history of the experience of the use of any new invention generally proceeded on similar lines, and that, in my opinion, the water-tube boiler had come to stay. Conflicting opinions on this subject are held so strongly that experience only can decide between them. On the one hand is arrayed the opinion of those who absolutely condemn the water-tube boiler; on the other, the deliberate policy of every naval Power, the report of our own recent Boiler Committee, and the opinion of every naval officer who is in command of a squadron which would have to act in war or who has the responsibility for decision at the Admiralty. If, as I believe will be the case, the offensive and defensive features of the new class of battleship now being designed, and of the Duke of Edinburgh class of armoured cruiser, give general satisfaction, it must be remembered that these results could not have been produced on anything like the displacement of these classes of ships but for the adoption of the water-tube type of boiler.

The destroyer fitted with the turbine system of machinery, the Velox—alluded to in my last statement—is now going through her trials, and so has enabled the Board to resume their experiments.

The experiments with oil fuel referred to in both my last statements have been steadily prosecuted with constantly encouraging results, and two battleships of the Channel Squadron, the Mars and the Hannibal, and the new armoured cruiser Bedford, are now being fitted in respect of some of their boilers for a more extended trial, both with oil fuel alone and with oil fuel in combination with coal. The problem which the Navy has to solve in the use of oil fuel is a much more difficult one than that which the Mercantile Marine has had to solve, because oil fuel can be of no use to the Navy as compared with Welsh steam coal unless the combustion can be brought to such perfection as to render the fuel practically smokeless.

Distribution of the Fleet.

The proposals of the Board of Admiralty in respect of the Australian Squadron are contained in the papers which have been laid before Parliament in connection with the recent Colonial

Conference, and I need not refer to them further here, as those proposals have still to be discussed by the Parliaments of the Commonwealth and New Zealand. It has been decided to sever the West Coast of Africa from the Cape Station and to form a new squadron, to be called the South Atlantic Squadron, which will serve the South-East Coast of America and the West Coast of Africa, and use Gibraltar and Sierra Leone as its bases.

The policy of changing the composition of the Home, Channel, and Mediterranean Squadrons of battleships so that, like the China Squadron, they shall be composed of homogeneous classes of ships, is steadily progressing, and will be continued in the coming year. Both the Mediterranean Fleet and the Channel Squadron have now two armoured cruisers apiece of the Cressy class, and the Cruiser Squadron, which has lately been placed under the command of a Rear-Admiral, will shortly, I hope, be composed only of 23-knot vessels—viz., two of the Drake and four of the Monmouth class.

Two additional Rear-Admirals have been appointed to the Mediterranean, one for service with the Cruiser Division of the Fleet and one as senior naval officer at Gibraltar, the importance of which as a base is so greatly increased by the approaching completion of the moles and docks.

The Fleet in home waters has been reorganised and placed under the orders of a Vice-Admiral in command, with a Rear-Admiral as second in command. His duties and responsibilities in respect of home waters are analogous to those of the Commander-in-Chief in the Mediterranean, except that they will in no way overlap or impinge upon the authority of the Commanders-in-Chief of the three home ports within their respective commands. The Home Fleet is quite independent of the Channel Squadron; it has as its nucleus of battleships the Home Squadron, consisting of the former Port Guard ships, which have been withdrawn from this service, and it has its headquarters at Portland. This squadron, in combination with the Coast Guard battleships and cruisers, composes the Home Fleet, which assembles three times in each year for joint exercises. Under the orders also, when required, of the Admiral commanding the Home Fleet will be the several destroyer flotillas along the coast, which are now organised each under its own captain and commander, with a stationary parent ship, and supervised by an inspecting captain of destroyers, who is responsible for the general organisation of the whole. Sheerness Dockyard will be specially organised to undertake large refits and repair work for destroyers and torpedo-boats. The Admiral-Superintendent of Naval Reserves, whose duties will be largely

increased in the future by the growth of the reserves, will have separate and independent functions, and will no longer command a sea-going squadron.

The increase of the Fleet in commission and reserve in home waters, and the consequent congestion of accommodation both for ships and men at the three home ports, led the late Board to appoint a committee to inquire into the whole question. After full consideration of the report of this committee, presented in January, 1902, the Board came to the conclusion that the time had arrived for the creation of a fourth naval base and depôt in the United Kingdom. After an examination of all the available sites and a thorough consideration of the question in its industrial and strategical aspects, necessarily extending over a good many months, the Board selected the Firth of Forth as fulfilling all the requirements of the Navy. Provisional negotiations have been proceeding for some weeks past, and proposals will be submitted to Parliament in the course of this Session for the acquisition of the land necessary to establish there a fourth home port.

I append the usual statement of the work done in the past year by the various departments of the Admiralty. SELBORNE.

February 14, 1903.

STATEMENT OF WORK, 1902–3, Etc.

Changes in the Composition of Fleets.

In the Mediterranean.

Three first-class battleships, Venerable, Repulse (transferred from the Channel Squadron), and Vengeance, have been added to the fleet.

The battleship squadron has been further reinforced in strength by the relief of Royal Oak and Royal Sovereign by Bulwark and London respectively—ships of more modern type. The Canopus is also shortly to be relieved by the Russell.

On the other hand the first-class battleship Hood has been withdrawn without relief.

The protected cruisers Andromeda and Theseus have been replaced by the two armoured cruisers Bacchante and Aboukir.

The second-class cruisers Intrepid and Hermione have replaced the third-class cruiser Barham and the coast defence ship Rupert.

There are now 28 destroyers (of which 20 are kept in commission) on the station, as compared with 24 last year.

A stationary depôt ship for torpedo boat destroyers on the station, the Orion, has been commissioned with an inspecting captain in command.

North America and West Indies Station.

The Crescent has been relieved as flagship by the Ariadne, a vessel of more modern type.

The third-class cruiser Psyche has been replaced by the second-class cruiser Retribution.

Orders have been given for the Urgent, depôt ship at Jamaica, to be sold, and the naval establishment to be removed to the shore.

The destroyers Quail and Rocket are to come home when convoy is available.

South-East Coast of America.

The Basilisk, sloop, has been ordered home without relief.

Pacific.

Orders have been given for the Liffey, store and depôt ship at Coquimbo, to be sold, and the stores to be removed to Esquimalt.

Orders have also been given for the torpedo boat destroyers Virago and Sparrowhawk to be transferred to the China Station.

Cape of Good Hope.

Monarch has been relegated to the position of depôt ship.

The gunboats Thrush and Rattler have been relieved by the Odin, sloop.

The shallow-draught gunboats Herald and Mosquito have been withdrawn from the Zambesi, their services there being no longer required.

East Indies.

The turret ships Abyssinia and Magdala have been transferred all standing to the Government of India. Of the other Indian coast defence vessels, three torpedo boats will for the present be retained by the Indian Government; of the remainder it has been arranged that the gunboats Plassy and Assaye and four torpedo boats shall be turned over to the Admiralty from the Indian Government. The first of these is already in England, the Assaye has been ordered to return, and the four torpedo boats are at Aden and are employed in the suppression of the arms traffic in the Gulf.

China.

Among other changes and withdrawals rendered possible by the termination of a critical period in China, the Orlando has been relieved by the more modern vessel Amphitrite, and of the ships lent temporarily to the China Station, the Arethusa, second-class cruiser, has been relieved by the Thetis, and is now on her way home, and the Astræa, second-class cruiser, has been withdrawn without relief.

Channel Squadron.

The protected cruisers Diadem and Niobe have been relieved by the two armoured cruisers Hogue and Sutlej.

The Arrogant has been relieved by the Doris.

The Furious is about to be paid off, her place being taken by the Hermes, which will join the Channel Squadron after undergoing trials.

Cruiser Squadron.

The first-class cruiser St. George and the second-class cruiser Juno have been replaced by the armoured cruisers Good Hope and Drake. The squadron will shortly be reinforced by the third-class cruisers Medea and Medusa, which at present are carrying out boiler trials under the direction of the Boiler Committee.

Home Fleet, etc.

The Dido, Venus, and Mersey have relieved the Galatea, Australia, and Severn as Coast Guard ships.

The Æolus, second-class cruiser, has replaced the Empress of India battleship as flagship at Queenstown.

Home Ports.

A captain R.N. has been appointed for special service in connection with torpedo boat destroyer flotillas, and three depôt ships for torpedo boat destroyers—the Audacious, at Chatham, the Warrior, at Portsmouth, and the Triumph, at Devonport—have been commissioned, to which the respective instructional destroyer flotillas are attached as tenders.

The battleships Devastation and Dreadnought have been appropriated to the torpedo schools at Portsmouth and Devonport for practice with submerged tubes.

At Portsmouth, the Hercules will shortly replace the Victory as flagship and signal school, and at Devonport the Téméraire has been commissioned as flagship and Fleet Reserve depôt ship.

The Undaunted has been commissioned as tender to the gunnery school at Devonport.

The Isis has been commissioned as a sea-going tender to the Britannia.

The Racer has been sent to Portsmouth for service in connection with the new cadets' establishment at Osborne.

Manœuvres.

In July operations in the Channel were carried out by the combined Channel, Home, and Cruiser Squadrons.

In September combined exercises and manœuvres were carried out in the Mediterranean by the ships of the Mediterranean, Channel, and Cruiser Squadrons.

Personnel.

Steps have been taken to organise an improved system of physical training for the men and boys of the Fleet, the "masts and yards" training, which has served the Navy so well in the past, having become no longer available.

The details of the new exercises and methods of instruction to be employed under the new scheme have been carefully considered, and the revised handbook will shortly be issued to the Fleet.

With a view to superintending the work of instruction when the

scheme is in full working order throughout the Fleet, it has been decided to create a staff of officers for this duty.

Early in the year a commander R.N. was appointed as Superintendent of Gymnasia, and a lieutenant R.N. and two marine officers were selected as Inspectors of Gymnasia. Arrangements have now been made for the appointment of twelve additional officers as inspectors.

The new system of training demands also a considerable increase in the number of instructors allowed to the Fleet. A new class of instructors has been formed, with improved pay and position. Their training has been taken in hand, and a small number already drafted to the Channel and Mediterranean Squadrons.

A limited number of staff appointments have also been created, open to the best qualified instructors.

The organisation of the Engineers' Training College at Keyham, which, in future, is to be styled the Royal Naval Engineering College, has been under consideration, the object of the Board being to improve the general training and education of engineer cadets as naval officers.

A captain, in lieu of a commander, has been appointed to superintend the college, and a staff of engineer officers has been associated with him in connection with the training of the engineer cadets throughout their professional and technical instruction, both in the college and in the dockyard workshops, following the principle established in the Britannia College at Dartmouth.

Several small improvements tending to increase the comfort and well-being of the students will be carried out at the same time.

Sanction has been obtained for a reduction of the age and qualifying service for promotion to artificer-engineer.

Amended regulations for the entry of surgeons have been published. The chief alterations are the improved scale of pay for medical officers, charge pay for inspectors-general in charge of hospitals, and also of medical officers in charge of hospital ships, rearrangement of the subjects of examination both for entry and for promotion, increased powers of admitting candidates by nomination of medical schools, colonial universities, etc., earlier promotion to those who have held appointments of house surgeons, and the payment of the fees of medical officers for civil hospital courses. The number of candidates at the competitive examination has improved since the new regulations have been in force, and the number of medical officers now on the active list is greater than at any time during the last quarter of a century.

A consultative board of eminent medical men has been formed,

with the Medical Director-General as president, to decide on the best method of dealing with special questions appertaining to the Medical Department.

Amended regulations for the employment of temporary surgeons in case of war or emergency, by which the pay has been materially raised and an equipment allowance granted, have attracted a satisfactory number of candidates.

A course of training has been instituted at Plymouth Hospital for sick-berth staff probationers, and a course of training in massage at Haslar, with extra pay for those qualified on appointment to a hospital.

Revised medicine chests, new field-service valise, emergency surgical dressings, Röntgen ray apparatus to ships as well as shore establishments, new metal aseptic operation-tables, microscopes and bacteriological outfits to H.M. ships, have been supplied, and the trial of various forms of stretchers on board ship have been, and are being, carried out.

Steps are being taken to provide an auxiliary sick-berth staff from volunteers of the St. John Ambulance Brigade and the St. Andrew's Ambulance Association Corps of Scotland.

In order that the chaplains of the Navy may be granted a licence which will be recognised by all bishops and other authorities of the Church of England and churches in communion with her throughout the world, they have been placed under the ecclesiastical jurisdiction of the Archbishop of Canterbury, the Admiralty retaining in full their authority over them as officers of the Royal Navy. The Chaplain of the Fleet has also been granted the ecclesiastical dignity of Archdeacon under the Archbishop of Canterbury, with whom he has been placed in official relations in respect of the spiritual welfare of members of the Church of England serving in the Royal Navy or Royal Marines.

THE ROYAL MARINES.

As a result of the new recruiting order that in the case of recruits for the Royal Marines a searching inquiry is to be made into the candidate's antecedents, similar to that required for the Royal Navy, the corps has been able to maintain its full establishment, while at the same time the wastage has been materially reduced.

An increase of pay amounting to 2*d.* a day has been granted to all warrant officers, non-commissioned officers, and men of the corps, in consequence of the similar advantage accorded to the Army.

During the year, 6196 Marines have passed the course of musketry afloat under naval conditions, about 10 per cent. qualifying

as marksmen; 3851 trained Marines have been exercised on shore under the Army Regulations, of whom about 20 per cent. qualified as marksmen, and 2131 recruits were trained for the first time.

Sanction has been obtained for the appointment of two assistant Marine Intelligence Officers for the Mediterranean—one at Malta and one at Gibraltar—with authority to pay allowances to similar officers when employed on other stations.

Naval Reserves.

In addition to the six signal stations already fitted with wireless telegraphy apparatus, eight others will probably be so fitted during the coming financial year. It is proposed to establish nine additional ones later on.

It is proposed to increase the *personnel* of the Coast Guard from 4200 to 4500, the number voted twenty years ago, but for the coming financial year only 4237 will be required. This increase is necessary to provide crews for new signal stations which are to be kept manned in peace time, and for wireless telegraphy work.

The number of executive officers R.N.R. now undergoing naval training in H.M. ships are:—

	Lieuts.	Sub-Lieuts.	Mids.	Total.
Twelve months' training .	20	30	18	68
G. and T. courses . .	4	16	10	30

Two hundred and seventy-six officers on the active list have already undergone this training, and are in receipt of training fees.

The establishment of engineers R.N.R., 400 of all ranks, is complete, viz.:—

Senior Engineers	74
Engineers	196
Assistant Engineers	130
	400

There are 80 qualified candidates on the list of applicants for appointment.

The following officers have completed or are now undergoing instructional courses at the dockyards:—

Senior Engineers	23
Engineers	68
Assistant Engineers	15
	106

Seamen, R.N.R.

The numbers borne on December 31 as compared with those voted for 1902–3 and former years are:—

Class.	Voted.	Borne.		
	1902-3.	31.12.02.	31.12.01.	31.12.00.
Qualified seamen	11,000	4,298	3,485	2,937
1st class (old system)		6,472	7,106	7,978
Seamen	11,000	5,572	4,973	4,218
2nd class (old system)		4,273	5,063	5,996
Totals	22,000	20,615	20,627	21,129

This shows that the total number of seaman ratings is approximately the same as it was a year ago.

1207 qualified seamen and seamen have been embarked in H.M. ships for naval training during the year 1902, as against 827 in the preceding year. 605 were similarly embarked in January, 1903.

The firemen have steadily increased, the numbers borne being—

On December 31, 1902	4033
„ „ 1901	3714
„ „ 1900	3530

The process of re-arming the drill ships and batteries is being continued.

The Gannet is nearly ready to replace the President in the West India Docks. The Satellite is to replace the Clyde at Aberdeen, and a stationary drill ship is to be provided for Kingstown.

It is also proposed to add to the number of R.N.R. batteries in Scotland.

GREENWICH HOSPITAL.

Landed Estates.—Extensive improvements have been effected in the sanitary condition of the house property at Greenwich, and a new roof has been erected over the market.

The dwellings of the workmen employed at the colliery at Scremerston have been enlarged, the water supply improved, and much-needed sanitary arrangements carried out.

Benefits of Greenwich Hospital.—Sanction has been obtained for the grant of pensions and allowances to the widows and children of seamen and marines who may die from accident or disease attributable to the service within two years of being certified to be ill, instead of twelve months.

Greenwich Hospital School.—The number of boys who left the

school during the year was about the average; but the percentage of boys who entered His Majesty's Service was 75·79, the highest proportion on record.

ORDNANCE.

During the financial year 1902–3 progress in gun manufacture and supply has been satisfactory. All requirements for re-armaments and for new construction have been fully met.

The re-armament of certain battleships and cruisers announced last year has made good progress.

The replacement of powder cartridges by cordite for B.L. guns, and in some directions the substitution of cordite M.D. for service cordite, has made good progress during the past year. Practically speaking, the effective war fleet may now be said to be provided with cordite.

Proposals for bringing up to date the armament of Royal Naval Reserve drill ships and batteries are now taking effect, and provision is made for continuous progress towards the completion of this service.

Steady improvement in defensive armour of modern ships imperatively demands higher ballistics in our guns, and this important and urgent question has been prominently before the Ordnance and Explosive Committees.

Investigations and experiments have been continuously directed towards the development of the most suitable propellant, the possibility of reconstructing and raising the power of some of the earlier marks of guns which still form part of our armaments, the construction of guns specially designed to give higher velocities under conditions of increased pressures, and the utilisation of nickel steel in gun manufacture.

A new naval ordnance depôt at Lodge Hill, in the Chatham district, is approaching completion. It is already partly in use, and it is expected that it will be fully occupied before the end of 1903. This will not only meet the demands of the Chatham district, but also tend to diminish the great concentration of munitions of war at Woolwich.

Since the last annual statement experiments with "capped" projectiles have been steadily progressing, in continuation of those made previously. The results have, so far, demonstrated the desirability of acting with caution as to the general adoption of this invention, in view of its merit being dependent to a considerable degree upon the ballistics of the gun from which the projectile is fired and the ranges at which it is more effective than others.

Coaling of the Fleet.

Progress is being made with the improvements in coaling facilities provided for in the Naval Works Act, 1901, particularly at the more important places.

A contract has been made for the supply of a large floating depôt with rapid working transporters for use at a home port, and the provision of other depôts of a similar description is in contemplation.

Some of the additional coaling craft fitted with modern appliances have been delivered, and provision for further craft is included in the estimates for 1903–4.

Before coming to any decision in regard to adopting an apparatus for coaling His Majesty's ships at sea, further trials of various schemes are in contemplation, which it is hoped will be carried out during 1903–4.

The reserve stocks of patent fuel at home and abroad have been added to during the year, and provision is made in the estimates for 1903–4 for further additions.

Provision is also made in the estimates for 1903–4 for craft for storing oil fuel for supply to ships and torpedo boat destroyers whose furnaces have been fitted for using this description of fuel.

New Construction.

The vote for new construction during 1902–3 is greater than in any preceding year. The work generally on the ships in hand has made good progress.

In order that the first-class cruisers included in last year's programme might have the best features embodied in their designs, it was necessary, towards the close of the year, to introduce several changes, which led to a delay in placing the contracts for these vessels.

It has been arranged during the year that the vessels in course of construction at the contractors' premises shall be completed by the contractors in all respects ready for immediately passing into the Fleet Reserve on delivery, instead of, as heretofore, leaving the carrying out of the trials, installation of the armament, and completion of certain details till after delivery at one of His Majesty's dockyards. It is anticipated that this new policy will result in economy of time and money, and will relieve the dockyards from a certain amount of work which can more profitably be devoted to the efficient maintenance of the fleet. Some of the vessels to be delivered by the contractors during the next financial year will be delivered in a completed condition under this new arrangement. The first of

the new vessels to be so delivered is the Donegal, building at the Fairfield Shipbuilding Company. She will be followed very shortly by the Lancaster, building at Elswick.

Battleships.

The trials of the London, Venerable and Russell, as well as those of the Duncan and Exmouth, were carried out with successful results. The speeds obtained on trial were slightly in excess of the estimated speeds as designed. The Montagu's trials are not yet complete.

Armoured Cruisers.

The trials of the new vessels of the Drake class have been carried out with successful results. The speeds obtained on trial were in all cases somewhat in excess of the estimated speeds as designed. Moreover, analyses of the trials showed that although the speeds were already in excess of the designed speeds, it was highly probable that by fitting new propellers still further increases of speed might be obtained. New experimental propellers were accordingly fitted to the Drake, with the result that the speed actually reached was slightly more than a knot in excess of the estimated design speed of 23 knots. Arrangements are being made to fit similar new propellers to the other vessels of the class.

The trials of the Bedford and Kent, of the County class, have been carried out, but the estimated speed was not obtained; it is, however anticipated that new propellers will overcome the deficiency. The Monmouth, a similar vessel, is now under trial with experimental propellers.

The new armoured cruisers of the present year's programme, viz., Duke of Edinburgh and Black Prince, are somewhat smaller than the Drake class, being 13,550 tons displacement as against 14,100 tons in the case of the Drake class. The estimated speed is 22⅓ knots, in comparison with the estimated speed of 23 knots in the case of the Drake class; but the armament of the new vessels is more powerful than that of the Drake class, and the armour defence is more effective. They should be completed in 1905–6.

Protected Cruisers.

On the commencement of the next financial year there will be under construction six vessels of this type, viz., Challenger, Encounter (*Second Class*); Diamond, Sapphire, Amethyst, Topaze (*Third Class*).

The Challenger will be passed into the Fleet Reserve during 1903–4, and the other five vessels, it is anticipated, will join the Fleet Reserve during 1904–5.

The two vessels of this type taken in hand this year, viz., Diamond and Sapphire, are sister vessels to Amethyst and Topaze.

Scouts.

Four vessels of an entirely new class, known as "scouts," have been ordered during the year, by contract. These vessels are named Adventure, Forward, Pathfinder, and Sentinel, and are building at Elswick, Fairfield, Laird's and Vickers' respectively.

It is expected that these vessels will be passed into the Fleet Reserve in 1904–5.

These vessels are to maintain a speed of 25 knots for eight hours' continuous steaming when in ordinary sea-going condition.

The coal supply is to be sufficient for a radius of action of not less than 3000 knots at 10 knots speed.

Designs for these vessels were furnished by the respective builders, but considerable time has been taken up in the preparation, examination, and modification of the various designs received.

Sloops.

At the commencement of the present financial year there were four vessels of this type, viz., Odin, Merlin, Cadmus, and Clio, under course of construction. The Fantôme and Odin have already been commissioned, and are now on their stations.

The Merlin will be passed into the Fleet Reserve during the present year. The Cadmus and Clio will be passed into the Fleet Reserve during 1903–4.

Torpedo Boat Destroyers.

During the year the Arab and Express have been commissioned. Two others, viz., Lively and Success, have been passed into the Fleet Reserve. These four vessels are the last of those ordered prior to 1901–2.

On the commencement of the next financial year there will be nineteen under construction. Four of these, viz., Velox, Ribble, Derwent, and Erne, will, if no delay occurs on the trials, be passed into the Fleet Reserve in 1903–4. The remainder will join the Fleet Reserve in 1904–5.

Eight of the nine torpedo boat destroyers added to the programme during the present financial year are practically repeats of the latest preceding torpedo boat destroyers. The remaining one, the Velox, has been purchased.

Torpedo Boats.

At the commencement of the year there were seven torpedo boats under construction, viz., Nos. 107 to 113 inclusive. Three of these, viz., 107, 108, and 109, will have been completed during the present year.

At the commencement of the next financial year there will be eight torpedo boats under construction, viz., 110 to 117, both inclusive, all of which are due to be passed into the Fleet Reserve during 1903–4.

Submarines.

At the commencement of the year there were five vessels of the Holland type under construction, viz., Nos. 1, 2, 3, 4, and 5, and they have all been delivered. Progressive trials will shortly commence to test their practical utility both for defence and attack.

Four vessels of an improved type, called the "A" Class, have been laid down, and it is hoped they will be completed during 1903–4. They will be distinguished as A 1, A 2, A 3, and A 4. Preliminary trials with A 1 have been carried out.

Armour.

Several trials have been made during the year to ascertain that the qualities of supplies from the armour-plate makers were equal to the contract conditions. In all cases the quality of the supplies was very satisfactory.

MACHINERY AND BOILERS.

Two more torpedo gunboats, the Leda and Halcyon, are being re-engined and re-boilered with small water-tube boilers, associated with light, quick-running engines, in addition to the Niger, Gossamer, Jason, and Circe.

The Niger and Gossamer have successfully completed their trials, and the Jason and Circe are well advanced.

New water-tube boilers have been fitted in six first-class torpedo boats, and new boilers have been delivered for six other first-class boats, and are being fitted on board.

New water-tube boilers are being made for ten more first-class torpedo boats, while arrangements are also being made to obtain new water-tube boilers for thirteen other boats.

During the last year it has been decided to adopt a combination of one-fifth cylindrical and four-fifths water-tube boilers in the six armoured cruisers of the Devonshire class of the 1901–2 programme, and also in the battleships and first-class cruisers of the 1902–3

programme, the four various types of water-tube boilers adopted being recommended by the Boiler Committee.

The cylindrical boilers of half the ships are fitted with closed stokeholds, and of the others with closed ashpit and heated air supply.

The Yarrow boilers of the Hampshire are fitted with closed stokehold draught, and those of the Antrim with closed ashpits and heated air supply.

The automatic forced lubricating arrangements fitted for main engines in the Syren, torpedo boat destroyer, have worked satisfactorily.

Turbine Propelling Machinery.

The Velox, fitted with turbine machinery, and also with small reciprocating engines for use at low speeds, has been purchased, and is now undergoing her trials.

Also one of the two third-class cruisers (the Amethyst) and one of the destroyers ordered last year are being fitted with turbine propelling machinery, but with small auxiliary turbines for use when cruising at low powers, instead of reciprocating engines. On the completion of trials of the above vessels information will be obtained as regards the more extended use of this system.

Water-tube Boiler Tests on Re-boilered Ships.

H.M.S. Hermes, under repair at Messrs. Harland & Wolff's, has been fitted with Babcock & Wilcox boilers, and the machinery trials for acceptance will shortly take place, prior to the vessel being handed over for a series of trials under the direction of the Boiler Committee, similar to those lately carried out in the Hyacinth.

The Medea and Medusa have been re-boilered with Yarrow (large tube) and Dürr types of water-tube boilers respectively, under the supervision of the Boiler Committee, and each ship has made a series of preliminary trials, but at which no complete records were taken, and the remaining series of trials will shortly take place.

Standardisation.

During the past year the question of making the machinery of war vessels interchangeable has received much attention, and a considerable advance in this matter has been made.

It has now been definitely arranged that practically all the auxiliary machinery in all new vessels of each class ordered at the same time is to be identical and interchangeable, and if practicable, and subject to any desirable improvements, they are made interchangeable with those of previous orders.

Reserve.

It has been decided to have a reserve of auxiliary machinery to enable repairs to be carried out more expeditiously, and this will gradually be developed, and together with the standardisation of certain parts of the main machinery, it is anticipated that repairs in peace time will be more quickly carried out, and in war time this interchangeability may prove to be of incalculable value.

LARGE REPAIRS AT THE HOME DOCKYARDS AND BY CONTRACT.

The following ships have been or will be completed:—By dockyards: Alexandra, Barrosa, Empress of India, Europa, Gannet, Hood, Northampton, Porpoise, Powerful, Resolution, Revenge, Royal Oak, Thetis, Thunderer and Undaunted. By contract: Aurora, Diadem,* Gossamer,* Hermes, Medea, Medusa, Niger * and Pelorus.

The following are now in hand, or their refit will have been commenced during 1902–3:—By dockyards: Arrogant, Audacious, Barfleur, Bonaventure, Centurion, Invincible, Juno, Leander, Philomel, Rodney, Tartar and Theseus. By contract: Circe, Colossus, Halcyon, Hecla, Howe, Jason, Leda, Niobe, Psyche, Spitfire and Terrible.

The details of the repairs and refits proposed to be carried out in 1903–4 appear in the Appendix to the Navy Estimates, but the principal refits to be commenced in 1903–4 are given below:—By dockyards: Andromeda, Cæsar, Furious, Magnificent, Majestic, Minerva, Nile, Proserpine, Ramillies, Repulse, Royal Sovereign, Trafalgar and Victorious. By contract: Argonaut, Astrea, Canopus, Crescent, Endymion, Goliath, Highflyer, Magpie and St. George.

NEW WORKS.

WORKS PROVIDED IN ESTIMATES.

Chatham.—The new receiving shed for stores and new gun mounting store will be completed, and considerable progress will be made with the new slaughter house during 1903–4.

Sheerness.—The new fitting shop will be practically finished by the end of March, 1904. The extension of rifle range will be finished in 1902–3.

Portsmouth.—The erection of the new steam factory is being proceeded with as rapidly as possible. The work of lengthening No. 12 dock is nearly completed. Good progress is being made with the extension of No. 13 dock.

* These vessels were re-engined and re-boilered by contract, the hull work having been completed in the Dockyard.

Devonport.—The new building slip is completed and the shops will be practically finished during 1902–3.

Gibraltar.—The new cold meat store, for the joint use of Army and Navy, will be completed in 1903–4.

Malta.—The new rifle range will be completed in 1903–4, during which year considerable progress will be made with the new torpedo range.

Singapore.—The work of providing naval ordnance store accommodation, the cost of which is jointly borne by Army and Navy, is progressing towards completion.

Dredging.—Good progress is being made at Malta with rock-dredging in French Creek, and a large quantity of mud has been removed from Sliema Creek. At Bermuda the berth for the new floating dock has been completed.

Coaling Depôts.—The work at Falkland Islands will be practically completed by the end of 1902–3. The new coal store and widening of jetty at Esquimalt are almost finished.

Hospitals. — The new general hospital at Portland and the additional accommodation at Hong Kong are expected to be completed in 1903–4. The new hospital blocks at Malta will be practically completed in 1902–3.

The principal new works for 1903–4 are :—

Osborne.—Accommodation for naval cadets.

Keyham. — Additions and alterations at the Royal Naval Engineering College.

Portland.—Canteen.

Gibraltar.—Additional distilled water tank.

Malta.—Renewing wharf walls in Dockyard Creek. Adaptation of War Department property for victualling purposes. Renewal of buildings in connection with hydraulic dock. New theatre at canteen.

Jamaica.—Official residences.

Sydney.—New prison on Garden Island.

Cape of Good Hope.—General hospital and sanatorium.

Wei-hai-wei.—Hospital accommodation.

Progress under Naval Works Loan Acts.

Enclosure and Defence of Harbours.

Gibraltar.—Admiralty Mole Extension.—The mole is being increased to its full section. Of the quay wall on the harbour side of the mole a length of 2809 ft. is finished and coped. The whole of the blockwork of the wall is complete.

The roundhead at the end of the mole is in hand.

Detached Mole.—Of the superstructure on the harbour side a length of 2322 ft. is complete with coping, and on the sea side 2263 ft. of parapet is complete.

The deepening of the harbour by dredging is making good progress, and a large portion has been finally sounded and taken over from the contractors.

Commercial Mole.—The waterport reclamation with wharf wall has been completed. A portion of the new wharf has been opened for traffic.

Northern Arm, outer slope.—A length of about 1500 ft. is pitched.

Portland.—About 48,300 superficial yards of facing have been executed, and a length of about 4620 ft. of the breakwater is completed, except partial filling in of joints.

Dover.—Admiralty Pier Extension.—The staging is complete for a total distance of 1628 ft. from the outer end of the original Admiralty pier.

Good progress has been made with the block-setting, the foundation course having been laid for a total length of 1370 ft.

Fair progress has also been made with the turret widening wall, and the foundations are now closed up to its junction with the Admiralty pier extension.

East Reclamation.—The work is now practically complete, with the exception of the coping, which has been set for a total length of 3400 ft.

East Arm and Root Wall.—The staging is completed to a distance of 2150 ft. from the junction of the east arm with the reclamation wall.

Good progress has also been made with the block-setting, the foundation course being laid for a total length of 1835 ft., the low-water course for 1635 ft., and the work complete to formation level for 1560 ft.

Malta Breakwater.—Necessary land has been acquired, and a contract let for the construction of Ricasoli and St. Elmo Breakwaters.

Adapting Naval Ports, etc.

Keyham Dockyard Extension.—Graving Dock No. 5.—Practically finished with the exception of the north and south ends of the east wall and the caisson cambers, which have been built to within 15 ft. of coping level.

Graving Dock No. 6.—The floor is nearly finished. The east wall and caisson cambers have been built to a level of 38 ft. below

coping. The west wall, with the exception of the north end, has reached the level of 13 ft. below coping.

Entrance Lock.—The floor has been completed. The east wall for a length of 400 ft. has been built to level of 36 ft. below coping, and for the remaining length to level of 46 ft. below coping. In the south camber the floor is completed.

Closed Basin.—About 950,000 cubic yards of mud have been excavated and removed to sea.

Tidal Basin.—Five concrete columns have been sunk for the foundation of head of north arm of entrance. Excavation over the site is in progress.

Outer Wall.—At the south end, for a length of 1000 ft., the wall is practically complete, and for a length of 300 ft. south and 450 ft. north of the entrance to closed basin the upper portion of the wall is in progress, and also for a length of 600 ft. at north end.

Pumping Station.—The building is practically completed; the boilers are all fixed in place in the boiler house, and the machinery is in course of erection.

Gibraltar Dockyard Extension.—The reclamation continues to make good progress. Part of the chief constructor's building has been taken over from the contractors, and is now occupied by dockyard; machine foundations put in and machines fixed.

Stores.—East wall complete. Piling, concrete foundations, and footings to all walls completed. All constructional steelwork in south-east compartment finished, and in progress in other compartments.

Permanent Hauling Engine House.—Complete, and in use as a store by dockyard.

Torpedo Stores.—All walls built.

Pumping Engine House.—All walling and roofing completed. Boiler-room and coal-store floors laid. Tank completed.

Underground Water Tanks.—Nos. 3 and 4 tanks completed, and in use.

The dams for all the three docks are completed, and the enclosed areas pumped dry. Excavation for docks 1 and 2 is in progress, and work on No. 3 dock is in a forward state, the walls being nearly up to coping level, and pumping arrangements practically completed.

Six of the slipways are completed.

Construction of the boat house is in forward state.

Malta Dockyard Extension.—The work of preparing sites is well advanced. Many of the subsidiary works are completed. Progress is being made on the two docks which are being built by contract;

but the work has been considerably retarded by difficulties due to the infiltration of sea water.

Bermuda Dockyard Extension.—The dredging is practically completed. The work of block-making, depositing rubble mound and mass concrete under the contract is progressing.

The new floating dock has arrived safely at Bermuda.

Hong Kong.—The reclamation in front of the Naval Yard and War Department properties is in hand. The dam for enclosing the dock is approaching completion. The North Wharf wall and Murray Pier extension are in progress. The diversion of the Albany Nullah is being proceeded with.

Simon's Bay Dockyard Extension.—A commencement has been made on the rubble embankments.

Deepening Harbours and Approaches. — At Portsmouth the approach channel has been dredged as far as possible. In the inner harbour ten berths have been finished, and three others well advanced.

At Devonport, in the work in progress above Saltash Bridge, twelve more berths are almost completed, in addition to the thirteen dredged last year.

Colombo Dock.—This work is in progress under the Colonial Government.

Chatham Dock.—Although serious difficulties have been met with in the execution of this work, more than three parts of it have been done, and it will be probably completed during 1903–4.

Coaling Facilities.—Gibraltar.—A tender for the construction of the coal island has been accepted, and the order given to commence the work. The railway from Waterport to the island is in progress.

Kowloon.—The briquette factory site has been acquired, and instructions given as to levelling the site, repairing wharf walls, etc., as necessary. Plot 36, adjoining the briquette factory site, has also been purchased.

A contract has been made for a large floating depôt for use at a home port.

A considerable amount of property has been acquired at Malta and Hong Kong for the storage of coal.

A jetty is being constructed at Haulbowline.

A contract is about to be made for the extension of the present coaling jetty at Portland.

Naval Barracks, etc.

Chatham Naval Barracks.—The buildings comprised in the first contract—viz., the seamen's quarters, officers' quarters and mess establishment, depôt offices, drill shed and stores, and the canteen,

together with the retaining wall, and all drains and water mains, grounds, footpaths, roads, and courtyards to the south of the retaining wall—were taken over from the contractors on March 26, 1902.

The north and lower east roads and footpaths, and the drains and water mains in same, were taken over from the contractors on December 11, 1902.

The buildings in the second contract—viz., Guard house with main entrance gates, cells, and post office, the warrant officers' mess, and the swimming bath, with bowling alley, together with all roads, drains, water mains, and grounds thereto—were taken over from the contractors on December 11, 1902.

It is anticipated that the barracks will be ready for occupation by April 1, 1903.

Portsmouth Naval Barracks.—Officers' quarters and mess are roofed in and walls plastered.

Men's blocks are completed, except flooring.

The subsidiary buildings are completed, except fittings.

The guard house is completed except painting, and the additional cells are in progress.

The formation of parades is in progress, and the boundary walls and main gate are completed.

The depôt offices are roofed in and partially slated. The electric lighting of the barracks generally is well advanced.

Keyham Naval Barracks.—The buildings included in the first contract, *i.e.*, two men's blocks, and the officers' mess and quarters, were taken over from the contractors on March 17, 1902, and are now occupied.

The buildings included in the second contract are in progress, the extension of the bowling alley being well advanced, and the concrete foundations of the provost establishment are being laid.

The sick quarters are completed, and were taken over from the contractors on December 12, 1902.

Chatham Naval Hospital.—In pavilions F 1 to F 6 work is well advanced.

The internal fittings of the pavilions are in progress, and the connecting corridors have been roofed in.

The administrative block is completed, with the exception of internal decoration and fittings, and the constructional work in the infectious blocks and all subsidiary buildings is practically complete.

The principal medical officer's and fleet surgeon's residences are nearing completion.

The chaplain's residence and sisters' quarters are roofed in and slated.

The police lodge is nearly completed.

Dartmouth.—"Britannia" R.N. College.—The sick quarters are completed. Good progress is being made with the main buildings, which are expected to be finished by November, 1904. This will admit of their occupation by Easter term, 1905.

Magazines.—At Chatham the Chattenden magazine has been taken over for use. Quarters for police and workmen have been completed, and arrangements are being made for the construction of a railway from Chattenden to Teapot Hard.

The work at Priddy's Hard and Bull Point is practically completed.

A new laboratory is being built.

Gibraltar.—A tender has been accepted for the new magazines at the back of the Ragged Staff. The work is to be completed in two and a half years' time.

February 14, 1903. S.

NAVAL TRAINING.

New Admiralty Scheme.

Memorandum by the First Lord.

The following memorandum by the First Lord of the Admiralty, dealing with the entry, training, and employment of officers and men of the Royal Navy and of the Royal Marines, was issued as a Parliamentary paper [Cd. 1385].

Introduction.

The Navy has reached a critical period in its development—a development which, steady and comparatively slow for the greater part of the last century, has now for fifteen years proceeded with startling rapidity.

After the great war, from 1815 onwards, there ensued a period of readjustment and retrenchment; the half-pay list embraced the majority of the officers of the Navy, comparatively few ships were in commission; it was necessarily not a period of innovation or of new ideas.

The application of steam to ships of war as a source of motive power was the first sign that the old order was beginning to change. At first admitted grudgingly as an occasional auxiliary to the sails, then acknowledged as an equal partner, then winning for itself supremacy, to-day the steam-engine has no rival, and sails have for ever disappeared from the equipment of fighting ships.

Gradual as was the revolution in respect of steam, so were the changes gradual in respect of the type of ship, her armour, and her guns. The wooden Victory, with her sail power and her 100 guns, eventually became transformed into the iron Inflexible, with her oval-tank boilers and her four 80-ton guns, but the process had been a slow one. The Navy had then been brought to the verge of a period in which vast improvements were about to take place in the battleship herself and in all the *matériel* which she contained. Cylindrical or locomotive boilers at low pressures were to give place to water-tube boilers at 300 lb. pressure; the strength and power of the engines were to receive marvellous development; numberless auxiliary engines were to replace manual labour or to

fulfil functions unknown before among naval requirements; muzzle-loading were to give place to breech-loading and they in their turn to quick-firing guns; brown powders, with much smoke and low velocities, were to be replaced by smokeless powders giving an ever-increasing velocity; the storm of shot and shell capable of being poured into or from a ship was to become ever more rapid and ever more murderous; to meet these conditions the whole fabric of the ship was to change, and Krupp or Harveyized steel to be substituted for compound armour, as compound armour had in its turn been substituted for iron; and finally, the ship herself, whose form and lines had during the transition period been the subject of wild experiment, was to regain a settled type in the Majestic class.

By a strange decree of fate the climax of this revolution in the *matériel* of the Navy has synchronized with its recent extraordinary development of strength in ships and of strength in men.

It is difficult to measure the change which has taken place in the last fifteen years. In that short period the officers and men of the Navy and Marines have increased from about 60,000 to over 120,000. There are several foreign navies more powerful to-day than the British Navy was fifteen years ago, and yet the relative standard has been maintained. Of the ships which formed the effective fighting ships of the Navy fifteen years ago but few remain on the effective list now.

The country can judge for itself what years of strenuous labour these have been for the Admiralty, years in which every task fulfilled was forgotten in the anxious effort to fulfil tasks which had yet to be done.

Throughout this period the Board never lost sight of the most important question of all those which confronted them, the education and training of the officers and men of the Navy, and the adaptation of that education and training to the new conditions under which the Navy has to work. Last year it was decided that the time had come formally to announce that training in masts and yards had disappeared never to return, and the growing importance of a fuller knowledge of engineering was emphasised by the order that in the future gunnery and torpedo lieutenants were to be held responsible for the care of the mountings and machinery of the weapons over which they have charge.

In the old days it sufficed if a naval officer were a seaman. Now, he must be a seaman, a gunner, a soldier, an engineer, and a man of science as well. It is not only that machinery driven by electric, hydraulic or steam power is every year becoming more complicated in character and multiplying in form, and that therefore a more

extensive education in applied science is necessary for specialised officers, but in various ways the need for a more general scientific training has become apparent. In dealing with this question the Board have been always conscious of the supreme importance of preserving to the naval officer his unmistakable naval character.

This character is developed from the early training in responsibility, the powers of self-reliance thereby engendered, and the essential unity of the Service. Notwithstanding the fact that during the transition period the system of naval education has been the subject of much criticism, the character of the naval officer has remained unimpaired, and character is of more value than knowledge. Now, however, as always, the highest type of naval officer is that wherein great professional knowledge is added to force of character. The danger within the Navy itself is lest insufficient importance should be attached to the results of study, and lest the value of what is called the practical character should be placed higher than it deserves. It is true that no student will ever become a victorious leader unless he is also a practical seaman and has the power of influencing men; but it is also true that no seaman, however practical, will be fit to rise beyond a certain rank unless he has thought out the problems of his calling as a student, and has omitted no opportunity of acquiring the knowledge that makes up the science of his profession. The officers of the Navy have never had cast on them a greater responsibility than at present, or one more difficult to fulfil. Their task will be impossible unless the Navy is kept abreast of the scientific, intellectual, and physical progress of the age, and it is they themselves who must keep it there.

The strength which its unity gives to the Service can hardly be over-estimated, yet in respect of this very matter a strangely anomalous condition of affairs exists. The executive, the engineer, and the marine officers are all necessary for the efficiency of the Fleet, they all have to serve side by side throughout their career, their unity of sentiment is essential to the welfare of the Navy, yet they all enter the Service under different regulations, and they have nothing in common in their early training. The result is that the executive officer, unless he is a gunnery or torpedo specialist, has been taught but a limited amount of engineering, although the ship on which he serves is one huge box of engines; that the engineering officer has never had any training in executive duties; that from lack of early sea training the marine officer is compelled, sorely against his will, to remain comparatively idle on board ship when every one else is full of work; and that the spirit of unity has not yet been carried to its full development.

The Board of Admiralty have studied this question of the education and training of naval and marine officers with prolonged and assiduous care, and they have determined on changes which they are convinced are adapted to the changed conditions of the time and will increase the efficiency and solidarity of the Service.

These changes are far-reaching, and in some respects sweeping, but the scheme which necessitates them is framed in pursuance of a definite policy, is planned on clear lines, is designed to deal with the problem as a whole, and is throughout conceived in a spirit of veneration for all that is best and highest in the traditions of the Service.

New Scheme.

It has been decided that henceforth—

1. All officers for the executive and engineer branches of the Navy and for the Royal Marines shall enter the Service as naval cadets under exactly the same conditions between the ages of 12 and 13;

2. That these cadets shall all be trained on exactly the same system until they shall have passed for the rank of sub-lieutenant between the ages of 19 and 20;

3. That at about the age of 20 these sub-lieutenants shall be distributed between the three branches of the Service which are essential to the fighting efficiency of the Fleet—the executive, the engineer, and the marine.

The result aimed at is, to a certain point, community of knowledge and lifelong community of sentiment. The only machinery which can produce this result is early companionship and community of instruction. These opportunities will be secured by a policy of :

One System of Supply.
One System of Entry.
One System of Training.

Entry of Cadets and Training of Cadets, Midshipmen, and Sub-Lieutenants up to the age of about 20.

I shall not attempt to give more than an outline of the scheme. Every detail connected with the education of these young officers will be carefully thought out and considered, and the best authorities, naval and civil, will be consulted by the Board of Admiralty.

In the first place I will explain why it has been decided to revert to the early age of 12 to 13 for entry as a cadet.

It is considered that entry at this early age is necessary if the cadets are by the age of 20 to receive that increased professional

education which is required to qualify them to become commissioned officers; and it is not considered that it would be compatible with the welfare of the Service if they were to become commissioned officers at any materially later age. In addition to this fact the present scheme must be looked at and judged as a long and carefully thought out whole. The complete development of the unity of the Navy is the great object which the Board have in view, and for this unity the early homogeneous training is essential. Moreover, the age of 12 to 13 not only corresponds to that at which the history of the Navy shows that boys have been most successfully moulded to sea character, but also it corresponds to the age at which boys leave private schools, and, therefore, to a natural period in the system of education which obtains in this country.

When the age of entry of cadets was raised to that at which it at present stands owing to the necessity of shortening the period of training at the Royal Naval College, so as to overtake the arrears in the supply of lieutenants to the increased Fleet, it was hoped by the Board that the future cadets would come from the public schools. This hope has been only imperfectly realised. The majority of public schools have made no special effort to train boys for the Navy, nor can I consider this wonderful. Nevertheless, it would be ungracious and unjust to omit this opportunity of expressing the cordial acknowledgments of the Board of Admiralty to those schools which have made a special and successful effort to train boys for competition for the Navy. I greatly regret the disappointment that will be caused to them by the change of system, but in the opinion of the Board the interests of the Service require the change, and the Board of Admiralty would not be faithful to their duty if they allowed any consideration to outweigh what they are convinced is for the good of the Service.

The entrance examination for the Royal Naval College, commonly known as the "Britannia" examination, will be of an elementary kind, and confined to those subjects in which a carefully-educated boy has usually been instructed up to the age of thirteen. No change will be made in the present system of entering boys for the competition, but the medical evidence is conclusive that at this early age the examination must not be severe, and, indeed, that no examination of boys at this age or at the later age now obtaining can be considered an accurate test of what their comparative faculties will be when they have attained manhood. It consequently follows that, during their period of training at the Royal Naval College, cadets who fail to attain a minimum standard or to show promise of sufficient development of intellect must be required to withdraw.

Cadets will remain under instruction at the Royal Naval College for four years before going to sea, and they will all receive similar instruction, which will comprise an extension of the "Britannia" course, including elementary instruction in physics and marine engineering, with the use of tools and machines in connection therewith. The object of this course will be to give them a good grounding in the subjects necessary to their profession, and at the same time such a general education as will enable them to grasp the theory of their future subjects of study, whichever branch they may eventually join.

At the end of this period the cadets will go to sea and become midshipmen ("Britannia" time counting, as at present). Special attention will then be paid to their instruction in mechanics and the other applied sciences and to marine engineering. The instruction of the midshipmen in seamanship will be given as at present by an executive officer deputed by the captain; otherwise it will, under the general responsibility of the captain, be supervised by the engineer, gunnery, marine, navigating, and torpedo lieutenants of their respective ships; they will be examined annually as to their progress in seamanship, navigation and pilotage, gunnery, torpedo work, and engineering, all set papers being as at present sent from the Admiralty, and at the end of three years every midshipman who has passed the qualifying standard at the last annual examination and the final examination in seamanship before a Board of three captains or commanders (constituted as at present) will become an acting sub-lieutenant and return to England. These acting sub-lieutenants will then go to the college at Greenwich for a three months' course of mathematics and navigation and pilotage, followed by an examination, and afterwards to Portsmouth for a six months' course in gunnery, torpedo, and engineering, at the close of which they will be examined, receive their classification 1, 2, 3 in each subject, and on passing out be confirmed in the rank of sub-lieutenant.

Before the period arrives at which the first batch of cadets under the new system have to go to sea, the Board will have considered very carefully and will have decided whether they shall be sent for the whole three years as midshipmen to battleships and cruisers ordinarily commissioned or whether the first part of this period shall be passed in specially commissioned training ships. It is quite decided that at whatever period they are posted to ordinarily commissioned battleships and cruisers, compulsory school on board these ships shall cease.

When the young officers, aged 19 to 20, have passed out of the College at Portsmouth as sub-lieutenants, and have gained their

classification in the different subjects of the examination, their careers for the first time will begin to diverge, and they will be posted to the executive or to the Engineer branch of the Navy or to the Royal Marines. As far as possible each officer will be allowed to choose which branch he will join, but this must be subject to the proviso that all branches are satisfactorily filled. No sub-lieutenant will be compelled to join a branch for which he did not enter as a boy when applying for a nomination, but in giving nominations for competition for entrance to the "Britannia" preference will (other things being equal) be given to those boys whose parents or guardians declare for them that they will be ready to enter either of the three branches of the Service. The Board of Admiralty will thus have in reserve a means of remedying a surplus or deficiency in either of the three branches, and of insuring that every branch receives a due proportion of the most capable officers.

Up to this point the young officers' characters have been formed in one school, and all these sub-lieutenants have received as the foundation of their professional education that common knowledge which all alike require. Henceforward their education must be differentiated to make them fit to perform those specialized duties which are the product of modern science.

The Executive Branch.

All the sub-lieutenants who join this branch will go to sea for two years, being warned that they will eventually have to pass a qualifying examination for promotion to the rank of commander in the following subjects:—

Court-martial Procedure.
International Law.
Knowledge of British and Foreign Warships, Guns, Torpedoes, &c.
Naval History.
Signals.
Strategy.
Tactics and Battle Formations.

They will not, however, be able to offer themselves for this examination till they have attained five years' seniority in the rank of lieutenant. After two years at sea all these executive sub-lieutenants will be promoted to the rank of lieutenant on gaining the same qualifying watch-keeping certificate as at present. All those who have passed their examinations exceptionally well will, as now, receive accelerated promotion. Those who are selected to be trained as specialists in gunnery, torpedo work, or navigation will go to the Royal Naval College at Greenwich for special courses,

and an entrance examination will be instituted at Greenwich for these specialists. This examination will carry with it the advantage of enabling the instruction at Greenwich to commence on a fixed basis.

Every facility consistently with the requirements of the Service will be given to those executive officers who are not specialists to attend voluntary courses at Greenwich in mathematics, naval history, &c., and to study foreign languages at Greenwich or preferably abroad.

The Engineer Branch.

The sub-lieutenants of this branch will go to the college at Keyham for a professional course, the exact duration of which will be determined with great care. At the expiration of this course a proportion to be equally carefully determined will be selected to go to Greenwich for a further course, while the remainder go to sea. They will then, if found qualified, all be promoted to be lieutenants under the same conditions as the executives. The nature and duration of the special course at Greenwich will be very carefully determined, and an opportunity will be afforded to those officers selected for it to make themselves acquainted with the latest developments of engineering science not only at Greenwich, but at the great civil engineering establishments and institutions which are to be found in the country.

By these arrangements sub-lieutenants of the Engineer branch will obtain their step in rank at the same age as the sub-lieutenants of the executive branch, and they will enjoy the same opportunities of accelerated promotion according to the classifications they receive at their previous examinations. The ranks of Engineer officers will be assimilated to the corresponding ranks of executive officers and the Engineer officers will wear the same uniform and bear the same titles of rank—*e.g.*, sub-lieutenant (E), lieutenant (E), commander (E), captain (E), and rear-admiral (E). The Engineer branch will receive additional pay, and although it is proposed to make the division into the various branches definite and final, every endeavour will be made to provide those who enter the Engineer branch with opportunities equal to those of the executive branch, including the same opportunity of rising to flag rank.

The promotion of future lieutenants (E) and commanders (E) will, as in the case of the executive officers, be by selection and qualifying service, and in the case of lieutenants (E) a qualifying examination for promotion to commander (E) will be instituted; moreover, the proportion of different ranks in the Engineer branch

will as far as possible be assimilated to that which will be fixed for the executive branch by the committee which is specially considering this question under the chairmanship of Lord Goschen. The endeavour will also be made to find a suitable number of high appointments for the flag officers of the Engineer branch.

THE ROYAL MARINES.

After his final examination as sub-lieutenant along with the future executive and Engineer officer the young Royal Marine officer will receive his special military training during the next two years partly at the college at Greenwich, and partly at the headquarters of divisions or the depôt; the training of all these officers will be extended so as to correspond more closely to the training now received by the young officers of the Royal Marine Artillery; and after this two years' training the young Marine officer will receive the rank and pay of lieutenant of Marines so as to put him financially on an equality with the executive sub-lieutenant. As in the case of executive lieutenants, specially good officers will qualify as gunnery and torpedo lieutenants, provided that they have kept watch at sea for one year, have passed the test examination for qualifying for gunnery and torpedo lieutenants, and been specially selected and recommended.

For the purposes of promotion and seniority in the corps all these officers will be on one list and not divided into two lists as is now the case with the officers of the Royal Marine Artillery and the Royal Marine Light Infantry.

The future Royal Marine officer will thus become available for keeping watch at sea and for general executive duties on board ship up to and including the rank of captain of Marines. His rank will be adjusted with that of naval officers as follows:

Naval.	Marine.
Sub-Lieutenant	Lieutenants under three years
Lieutenant	Lieutenant over three years Captain
Commander	Major
Captain under three years	Lieutenant-Colonel

The above ranks will only hold good while on ships' books. The relative rank when under the Army Act will remain as at present.

On shore, when employed with landing parties and with naval brigades, etc., Naval and Marine officers will take command over one another according to their seniority in their corresponding ranks. It

will also be arranged that one of the special duties of officers of the Royal Marines will be to advise in respect of the organisation, equipment, and training of landing parties, and work on shore.

The pay of Royal Marine officers when they are serving afloat will be equalised with the pay of executive officers of the Navy of corresponding rank; and the proportion of different ranks of officers in the Royal Marines will, as far as possible, be assimilated to that to be laid down for executive officers of the Navy by the committee of which Lord Goschen is chairman.* The object to be aimed at is that there may be the same proportion of employment in the higher ranks and the same proportionate flow of promotion for the officers of the Royal Marines as for those of the executive and Engineer branches of the Navy.

It may be urged by some that the early naval training of the marine officer may militate against his subsequent military training, but in the opinion of the Board this is not so. The future Royal Marine officer will join his corps at a little later age than at present, but with the great advantage of having been trained to a sea life and having received an excellent naval education. Henceforward the efficient military marine officer will exist as of old, but with this difference, that from the very outset of his career as such he will be competent to take a much fuller part in the handling and fighting of his ship than his present training has permitted.

Transition Stage.

The cadet now takes about four and a half years to become an acting sub-lieutenant; under the new system he will become fitted for the general service of the fleet in seven years, while the Engineer and Royal Marine officer will require about two years more for their special professional instruction. The new system will be introduced in midsummer, 1903. Supposing (what would not in any event be feasible) that all entries under the present conditions were to cease immediately, the lists would be recruited for four and a half years by the entries of already existing cadets, but at the expiration of that period there would be an interregnum of two and a half years before entries under the new system became effective, that is, as acting sub-lieutenants; similarly during the next five years the lists would be recruited by engineer students who have already been entered; there would then be an interregnum of five years before the first of the new engineer officers became available; the lists of the Royal Marine Artillery and the Royal Marine Light Infantry would be recruited by candidates already entered for two or one years respectively,

and then an interregnum would supervene for six and five years respectively.

To fill the lists during the interregnum it will become necessary to have recourse to double entries for a period. After the entry of cadets from twelve to thirteen has commenced the normal number of entries at fourteen and a half to fifteen and a half must continue to be made for two and a half years, so as to supply executive officers during the interregnum. The normal entries for the Royal Marine Light Infantry must continue for six years and those for the Royal Marine Artillery must continue for five years at the present age; while the entry of engineer students at fourteen and a half to sixteen and a half must also continue for five years. The result of this will be that for two and a half years, or rather more, there must be two sets of cadets, those aged fourteen and a half to fifteen and a half and those aged from twelve to thirteen; for many reasons it is considered unadvisable that these two sets of cadets should be trained together; it has, therefore, been decided to educate the younger one in the Isle of Wight, where His Majesty has most graciously put at their disposal a portion of the Osborne estate.

The above is the most convenient method of bridging the period of transition; all the alternative methods have been carefully considered and found to have grave disadvantages.

The Present Engineer Officer.

The Board are confident that the naval Engineer officer of the future will maintain to the full the high traditions of the present Engineer branch, but they feel that this scheme would not be complete if it did not include changes designed to harmonize as far as possible the position of the present officers of the Engineer branch with the spirit of the future organisation.

Accordingly, the following changes will be made in the designations of rank:—

Engineer students will become Engineer cadets, and the college at Keyham will be known as the Royal Naval Engineering College.

Assistant-engineers for temporary service and assistant-engineers will become Engineer sub-lieutenants.

Engineers, chief engineers, and staff engineers will become Engineer lieutenants.

Fleet engineers will become Engineer commanders.

Inspectors of machinery will become Engineer captains, and chief inspectors of machinery will become Engineer rear-admirals.

The engineer-in-chief will become an Engineer rear-admiral,

and the Board reserve power to promote the officer holding that high post to the rank of Engineer vice-admiral if thought advisable.

The average period of reaching each rank will be assimilated as far as possible to that of the Executive branch, so as to correct the present disparity of age, which too often obtains between officers of the two branches of relatively equal rank;* the pay of existing Engineer officers will be raised; but no changes will be made in their uniform or in the regulations which define their duties or in the provisions of the Naval Discipline Act.

The Board have given their careful and earnest consideration to all the suggestions which have been made from a variety of quarters for further changes affecting the present Engineer officers. The decision at which they have arrived is, they are convinced, that most conducive to the interests of the Service as a whole.

The Present Marine Officer.

The comparative non-utilisation of the services of the marine officer on board ship has long been a matter of regret on the part of successive First Lords and successive Boards of Admiralty; but his want of early sea training and his want of knowledge of the general duties of the ship when first embarked have hitherto rendered the young marine subaltern unable to take any responsible part either in the general work or in the navigation of the ship. The sole reason, therefore, of the comparative non-utilisation of the marine officer's services on board ship has been his purely military training. This condition of affairs has naturally been discouraging in the extreme to the young marine officer himself, and it has been detrimental to the Navy, which has found itself deprived, in respect of many important matters, of the services of a valuable officer.

The new scheme will alter all this; but the present question is, How can the services of the existing marine officer be better utilised on board ship? It has been decided that the present marine officers shall be made available for employment in gunnery and torpedo duties, in harbour work such as officer of the guard, and generally in taking a more active part in the duties of the ship. They will, moreover, be held eligible for equal consideration with naval officers for employment in Admiralty departments, such as the Department of the Director of Naval Ordnance and the Naval Ordnance Store Department, and as members of the Ordnance Committee. They are already to the great advantage of the Service largely utilised in the

* The Board are fully aware of the importance of this question to the officers of other branches than those dealt with in this Memorandum, and are now engaged in considering it.

Naval Intelligence Department and generally in connection with the intelligence work of the fleet. Their employment in this sphere of work will continue to be developed, and it is also thought that a much-felt want in respect of the supply of interpreters may be remedied by holding out inducements and giving facilities to the present marine officers to qualify as such. The question of the rates of pay of the existing marine officers is being carefully considered, with a view to its equitable adjustment to the special circumstances of their employment.

It has been suggested to the Board that the present would be an opportune moment for the amalgamation of the Royal Marine Artillery and the Royal Marine Light Infantry. The Board, however, feel that in the case of a corps with the old traditions of the Royal Marines great respect must be paid to sentiment, where-ever it does not clash with a reform essential to the good of the Service. This is not so in this case, and the question of future amalgamation will be left to solve itself in the expectation that the general opinion of the corps will be found to harmonize with the logic of hard facts. As the future marine officers will all be on one list, and as their gunnery training will be as far as possible assimilated to the present training of the artillery officers, and as the future gunnery and torpedo lieutenants of the corps will correspond as specialists to the present artillery officers, the future impediments in the way of amalgamation would seem to consist mainly in the name and in the colour of the uniform. As regards the uniform time will solve the problem, but as regards name I cannot imagine one more universally honoured than that of the Royal Marines.

The great difficulty which has always confronted the Board of Admiralty in respect of this famous corps has been that of finding a sufficient amount of employment, and employment of a sufficiently interesting and engrossing character for the general officers. This difficulty has arisen from the fact that the Royal Marines, owing to their special history have not been able to enjoy the advantages and opportunities of employment in the higher ranks either of officers of the Navy or of the Army. They have not been able to enjoy the advantages of corresponding officers of the Navy because they have never had the training to command ships, squadrons, or fleets. They have not been able to enjoy the opportunities of corresponding officers in the Army because they have not formed part of that Army, and the War Office has regarded the officers of the Army as having the first claim upon it for employment. Time has wrought many changes in the conditions of service both in the Royal Navy and

in the Royal Marines, and the current of events has set the Royal Marines more towards the Navy than towards the Army. The Royal Navy is indispensable to the Royal Marines and the Royal Marines are indispensable to the Royal Navy, and I hope that the officers both of the Navy and of the Marines will realise more and more in the future that the Royal Marines and the Royal Navy are but two great parts of the one sea service on which this country depends.

If at any future time an even closer union between the Navy and the Marines becomes possible than that now contemplated, it will be necessary that the Royal Marines should come wholly under the Naval Discipline Act (amended to meet the case) and cease to be partly governed under the Army Act.

Warrant Officers, Petty Officers, and Men.

Nearly half a century has passed since the introduction of the continuous service system, and it is scarcely possible to exaggerate the value of that reform to the Navy. It is no disparagement to the splendid fighting qualities and the daring seamanship of the sailors of bygone days to assert that the lower deck of to-day has added to its fame for handiness and discipline a character for sobriety and respectability previously unknown. In the old days there was no assurance of a career to the men, there was no certainty to the State that on an emergency the men required to man the fleet for war would be forthcoming. To-day the manning of the fleet can be organised with mathematical precision and every well-behaved man can rely on continuous employment followed by provision for old age.

Consequently, the Navy has become to the men what it always has been to the officers, the profession and devotion of a lifetime, and a corresponding responsibility rests on the Board of Admiralty to see that as the circumstances of the time change a career commensurate with this fact remains open to them, and that their training and education is as fully adapted to the work they have to perform as that of the officers.

In this connection, I am able to announce that the following principles have been agreed upon by the Board:

(i) That the Masted Training Squadron being abolished, and the importance of gunnery and the use of machinery daily increasing, the present is an opportune moment for reviewing the whole course of training.

(ii) That *specialization* which must be continuous and systematic becomes more and more urgent, and this fact must be borne in mind

in considering the system of training. This does not, of course, mean that *every* man should have a specialized training.

(iii) That an accumulation of men in barracks on shore is a new feature in naval life, and that the utmost care must be taken to establish a system whereby the time of the men in barracks may be utilised to the greatest advantage of the Navy and themselves.

(iv) That the lines on which the gunnery and torpedo schools may best be developed should now be settled, especially as the proposal has been brought forward that the torpedo schools should imitate the example of the gunnery schools in forming great shore establishments.

The detailed plan on which these general principles will be put into operation will be most carefully considered, and I can only at present state that it has been decided not to build great barracks for the torpedo schools, or to transfer them to establishments ashore, and further indicate some of the decisions that have been taken affecting the various ratings and ranks:

(i) It is proposed to enter between fourteen and sixteen years of age boys to be called "boy artificers," who will be most carefully trained, and whose engagement will be to serve for twelve years continuously from the age of eighteen.

In this manner a second source of supply will be formed for the ever increasing needs of the fleet in respect of engine-room artificers.

(ii) It has long been a complaint on the part of the Engineer branch that an engineer officer on board each ship is employed in clerical duties. It is proposed to remedy this by establishing a non-substantive rating of engineer's writer, and the engine-room complement will in future include this rating to be held preferably by men of the stoker class.

(iii) The engine-room complement of every sea-going ship will also include the non-substantive rating of "yeoman of stores," to be held by a chief or leading stoker.

(iv) Young and promising leading stoker mechanics, not over thirty years of age, will be eligible for the new rating of "mechanician"; selected candidates will be required to pass the educational examination established for the rating of engine-room artificer; they will then receive a careful further training, at the end of which it will be sufficient if it is shown that the men possess the requisite skill to give valuable aid in the ordinary repairs and casualties of an engine-room or stokehold; "mechanicians" will take rank as chief petty officers immediately after engine-room "artificers," and be granted suitable rates of pay, increasing with length of service.

The stokers have recently been placed on an equality with the

seamen and marines in respect of the grant of a free kit on entry. This concession and the addition of these three new ratings will, it is hoped, greatly augment the attractiveness of this Service.

(v) The numbers of artificer engineers and chief artificer engineers will gradually be largely increased.

(vi) There has been for some time past a deficiency in the signal ratings of the fleet. To remedy this an increase has been made in the pay of the class by the grant of 6*d.* a day to a large percentage of the higher ratings, and thus the signal ratings have been put upon an equality with the gunnery and torpedo ratings, and the expected result of attracting the required number of volunteers for the signal branch of the Service has been produced.

(vii) There has for some time past been a strong feeling that the appearance, the system of training, and the standard of efficiency of naval bandsmen are unsatisfactory, and that an unfair proportion of the cost of naval bands falls upon the officers.

The Board have now under consideration a plan for the complete reorganisation of naval bands, the effect of which it is believed will be to bring substantial relief to the officers in the matter of expense.

(viii) The chief petty officers of the fleet have long felt it a hardship that, notwithstanding the great importance and responsibility of their position, they receive no higher rate of pension than a first-class petty officer.

The Board are glad to be able to announce that it has been decided to increase the pensions of chief petty officers by ½*d.* a day for each year's service in chief petty officers' rating subsequent to the completion of their first engagement. This apparently small change will alone entail an eventual charge on naval funds of no less a sum than £73,000 a year.

Promotion of Lieutenants from Warrant Rank.

The Board have long been anxious to see their way to promote a certain proportion of gunners, boatswains, and carpenters to the commissioned ranks, and thus afford to the lower deck of the Navy opportunities of rising similar to those which the rank and file of the Army enjoy by the opportunity of promotion to the rank of quartermaster or riding master. It is accordingly a great satisfaction to them to be able to announce that a list has already been drawn up of sixty appointments to which these officers can be promoted, and that the proportion of each branch of warrant officer which will be promoted to lieutenant will be the same, as nearly as possible, as the proportion of each of those branches to the combined total of the warrant officers' list. A proportionate number of commissions will

also be allotted and employment found on the same principles for the warrant officers of the Engineer branch. If the officers promoted are selected from among the seniors, and thus have not too many years to serve to complete their age for retirement, no difficulty will arise as to their continued employment or as to the avoidance of half-pay, which they could not afford.

CONCLUSION.

Such in outline are the proposals which are designed not only to improve the position, prospects, and pay of the warrant officers, chief petty officers, and men of the fleet, but also to improve their training and to complete the organisation of the fleet where it is at present at all defective in its *personnel*. Due care has been taken that these changes shall not conflict, but harmonise with the recommendations which will presently be made by the committee, of which Sir Edward Grey is chairman, in respect of the manning and reserves of the fleet.

Important, however, as is the part of the scheme which affects the men, that which affects the officers is still more important.

The cardinal feature of the scheme is the homogeneous training of executive, engineer, and marine officers. The policy of the Board is to create a body of young officers who at the moment of mobilisation for war will be equally available for all the general duties of the fleet and to consolidate into one harmonious whole the fighting officers of the Navy.

Difficulties doubtless there will be in carrying this part of the scheme into full effect, but those difficulties have been foreseen, and they will be met. The advantages to the Navy of the realisation of the scheme will be inestimable and permanent; the difficulties will be secondary and transient. The Board are conscious that on them alone rests the responsibility, and that they alone have the advantage of knowing all the conditions which govern the problem. The step which they have taken is a long step forward to increase strength, and for aid in the task of consolidating their work they rely with supreme confidence on the loyalty to the Service of the officers of the Royal Navy and of the Royal Marines.

(Signed) SELBORNE.

Admiralty, December 16, 1902.

THE NEW REGULATIONS.*

The Admiralty have also issued a circular letter to the fleet giving a summary of the new regulations which are to be introduced next year. In two important particulars this circular adds to the information given in Lord Selborne's memorandum. There is an outline of the proposed syllabus of the examination for the entry of cadets, and tables of the new scale of pay to be given to engineer and marine officers, both those on the existing lists and those to be entered in the future. The syllabus will be explained more fully in a statement to be issued later for the information of candidates. As regards the scales of pay, it will be noticed that the commandants of Royal Marines will receive 12*s.* a day, corresponding to the "command money" of captains commanding naval establishments on shore, while the second commandants will receive 5*s.* a day.

Entry Examination of Cadets.

The following is the syllabus of the examination for the entry of cadets under the new scheme :—

Part I.

1. English (including writing from dictation, simple composition, and reproduction of the gist of a short passage twice read aloud to the candidates).

2.—(*a*) History and (*b*) geography—
- (*a*) History (simple questions in English history and growth of the British Empire).
- (*b*) Geography (simple questions, with special reference to the growth of the British Empire).

3. French or German (importance will be attached to the oral examination).

4.—(*a*) Arithmetic and (*b*) algebra—
- (*a*) Arithmetic (elementary, including vulgar and decimal fractions).
- (*b*) Algebra to simple equations, with easy problems.

5. Geometry (to include the subject-matter of the First Book of Euclid, or its equivalent in experimental geometry and mensuration. The use of instruments and of algebraical methods will be allowed).

Part II.

(One only to be taken.)

6. Latin (easy passages for translation from Latin into English and from English into Latin, and simple grammatical questions).

7. A second modern language (of which, if not French or German, notice must be previously given), or an advanced examination in the language selected under Part I.

8. Experimental science (easy questions with the object of testing practical knowledge and powers of observation).

The list of successful candidates will be published in alphabetical order.

* From the *Times*.

The New Scales of Pay.

The changes in pay shown in the annexed tables will take effect from April 1, 1903 :—

TABLE A.

Future Engineer Officers.

Rank.	Pay per Diem.
	s. d.
Lieutenant (E.)	12 0
,, ,, of 4 years	14 0
,, ,, of 8 years	16 0
,, ,, of 10 years	17 0
,, ,, of 12 years	18 0
,, ,, of 14 years (maximum)	20 0
Commander (E.)	24 0
,, ,, of 2 years	27 0
,, ,, of 4 years	30 0
,, ,, of 6 years	33 0
Captain (E.)	35–40 0
Rear-Admiral (E.)	60 0

TABLE B.

Future Marine Officers.

Rank.	Pay per Diem.
	s. d.
Lieutenant	10 0
After 4 years in rank	11 0
Captain	12 0
After 1 year in rank	13 0
,, 5 years ,,	15 0
Major	20 0
After 2 years in rank	22 0
,, 4 ,, ,,	24 0
,, 6 ,, ,,	26 0
Lieutenant-Colonel	30 0
After 2 years in rank	33 0
,, 4 ,, ,,	36 0

Colonels 2nd Commandant will receive pay of rank and an additional allowance of 5*s*. per diem.

Colonels Commandant will receive pay at present rates, with an additional allowance of 12*s*. per diem.

TABLE C.

EXISTING ENGINEER OFFICERS.

New Ranks and Scale of Pay.

Rank.	Pay per Diem.	
	s.	d.
Engineer Lieutenant	10	0
After 2 years	11	0
,, 4 ,,	12	0
,, 6 ,,	13	0
,, 8* ,,	16	0
,, 10 ,,	17	0
,, 12 ,,	18	0
,, 14 ,,	20	0
Engineer Commander	24	0
After 2 years	27	0
,, 2 ,,	30	0
,, 4 ,,	33	0
Engineer Captain	35–40	0
Engineer Rear-Admiral	60	0

* This pay of 16s. a day, together with the right to wear the uniform of the increased rank of Engineer Lieutenant of eight years' seniority, will be dependent on his obtaining a qualifying certificate and on being selected.

TABLE D.

EXISTING MARINE OFFICERS.

New Scale of Pay.

Rank.	Artillery Pay per Diem.		Infantry Pay per Diem.	
	s.	d.	s.	d.
Lieutenant	6	4	5	11
After 3 years	7	5	7	0
Captain	12	1	11	7
After 1 year	12	7	12	1
,, 5 years	13	1	12	7
,, 8 ,,	14	7	14	1
Major	16	1	15	7
After 2 years	17	6	17	6
,, 4 ,,	18	0	18	0
,, 6 ,,	18	6	18	6
Lieutenant-Colonel	21	0	21	0
After 2 years	21	9	21	9
,, 4 ,,	22	6	22	6

Colonels 2nd Commandant will receive pay of rank and an additional allowance of 5s. per diem.

Colonels Commandant will receive pay at present rates, with an additional allowance of 12s. per diem.

FUTURE EXAMINATIONS.

We have also received the following from the Admiralty for the information of parents and guardians :—

The new scheme of entry and training of executive and engineer officers of the Royal Navy and officers of the Royal Marines, by which all candidates for commissions will enter as naval cadets, under identical conditions, between the ages

of 12 and 13, will be introduced in July, 1903, when the first examination will be held.

During the period of transition from the existing to the new regulations the examination of candidates will be held under both regulations three times a year at the customary dates.

Under the new scheme, a candidate will not be eligible for the examination in July who is less than 12 or more than 13 years of age on September 15 following, nor for the examinations in November or March who is not within those limits of age on January 15 or May 15 following, respectively.

Under the old scheme:—

The last examination for naval cadets entering the Britannia at the ages of 14½–15½ will be held in November, 1905.

The last examination for engineer students entering the Engineer Students' Training College at Keyham of the ages of 14½–16½ will be held in March, 1906.

The last examination of candidates for commissions in the Royal Marine Artillery of the ages of 16–18 will be held in June, 1908.

The last examination of candidates for commissions in the Royal Marine Light Infantry of the ages of 17–19 will be held in June, 1909.

N.B.—The ages of entry in the Royal Marines under the old scheme must be regarded as subject to possible revision in consequence of recent changes in the Army Regulations.

The medical examination of candidates under the existing scheme will be conducted as before. Under the new scheme all candidates will be medically examined by the Medical Director-General of the Navy in accordance with the recent practice as regards candidates for entry in the Britannia.

Draft Agreement between His Majesty's Governments of the United Kingdom, the Commonwealth of Australia, and the Colony of New Zealand.

The Commissioners for executing the office of Lord High Admiral of the United Kingdom of Great Britain and Ireland, etc., and the Governments of the Commonwealth of Australia and of New Zealand, having recognised the importance of sea power in the control which it gives over sea communications, the necessity of a single Navy under one authority, by which alone concerted action can be assured, and the advantages which will be derived from developing the sea power of Australia and New Zealand, have resolved to conclude for this purpose an agreement as follows:—

Article I.

The naval force on the Australian Station shall consist of not less than the undermentioned sea-going ships of war, all of which shall be from time to time throughout the terms of this agreement of modern type, except those used as drill ships:—

1 armoured cruiser, first-class;
2 second-class cruisers;
4 third-class cruisers;
4 sloops;
And of a Royal Naval Reserve consisting of 25 officers and 700 seamen and stokers.

Article II.

The base of this force shall be the ports of Australia and New Zealand, and their sphere of operations shall be the waters of the Australia, China, and East Indies Stations, as defined in the attached schedules, where the Admiralty believe they can most effectively act against hostile vessels which threaten the trade or interests of Australia and New Zealand. No change in this arrangement shall be made without the consent of the Governments of the Commonwealth and of New Zealand; and nothing in the agreement shall be taken to mean that the naval force herein named shall be the only force used in Australasian waters should the necessity arise for a larger force.

Article III.

This force shall be under the control and orders of the Naval Commander-in-Chief for the time being appointed to command His Majesty's ships and vessels on the Australian Station.

Article IV.

Of the ships referred to in Article I., one shall be kept in reserve and three shall be only partly manned and shall be used as drill ships for training the Royal Naval Reserve, the remainder shall be kept in commission fully manned.

Article V.

The three vessels used as drill ships and one other vessel shall be manned by Australians and New Zealanders as far as procurable, paid at special rates, and enrolled in proportion to the relative population of the Commonwealth and New Zealand. If a sufficient proportion of men from either Colony should not on the aforesaid basis be forthcoming, a sufficient number of men to complete the complements of the ships may be enrolled from the other Colony.

They shall be officered by officers of the Royal Navy, supplemented by officers of the Royal Naval Reserve.

Article VI.

In order to ensure that the Naval Service shall include officers born in Australia and New Zealand, who will be able to rise to the highest posts in the Royal Navy, the undermentioned nominations for naval cadetships will be given annually :—

Commonwealth of Australia	8
New Zealand	2

Article VII.

The branches of the Royal Naval Reserve established in Australia and New Zealand shall be called into actual service by his Majesty in Council, acting on the advice of his Governments of the Commonwealth of Australia and New Zealand respectively.

The men forming the Royal Naval Reserve shall be divided into two classes :—

(*a.*) Those who have served for three years on board one of his Majesty's ships.

(*b.*) Those who have not so served.

These men shall be trained on ships specially provided for the purpose.

The officers of this reserve force shall be included on the list of officers of the Royal Naval Reserve.

ARTICLE VIII.

In consideration of the service aforementioned the Commonwealth of Australia and New Zealand shall pay the Imperial Government five-twelfths and one-twelfth respectively of the total annual cost of maintaining the naval force on the Australian station, provided that the total amount so paid shall in no case exceed £200,000 and £40,000 respectively in any one year. In reckoning the total annual cost a sum equal to 5 per cent. on the prime cost of the ships of which the naval force of the station is composed shall be included.

ARTICLE IX.

The Imperial Government recognise the advantages to be derived from making Australasia a base for coal and supplies for the squadrons in Eastern waters.

ARTICLE X.

1. This agreement shall be considered to become actually binding between the Imperial Government and the Commonwealth of Australia and New Zealand so soon as the Colonial Legislatures shall have passed special appropriations for the terms hereinafter mentioned, to which Acts this agreement shall be attached as a first schedule.

2. The agreement shall be for a period of ten years, and only terminate if and provided notice has been given two years previously, viz., at the end of the eighth year, or at the end of any subsequent year, and then two years after such date.

ARTICLE XI.

1. The payments named in Article VIII. shall be considered as payments in advance, and shall first become due and payable six months after the Colonial Legislature shall have passed the special appropriation referred to in Article X.

2. The period of ten years referred to in Article X. is to be calculated from the date on which the Colonial Legislature passes the special appropriation referred to.

3. The payments under the existing agreement and that agreement itself shall terminate on the date on which the payments under the new agreement commence.

4. The share of these payments due from each colony shall be paid annually in London by the High Commissioner of the Commonwealth and the Agent-General of New Zealand, and, pending the appointment of the first-named officer, by such person as the Government of the Commonwealth may nominate, to such account as the Lords Commissioners of the Admiralty may direct.

ARTICLE XII.

In time of peace one of the drill ships referred to in Article IV. and one other cruiser shall be stationed in the waters of New Zealand and its dependencies as their headquarters. Should, however, such emergency arise as may, in the opinion of the naval commander-in-chief, render it necessary to remove either or both of such ships, he shall inform the governor of the reasons for such temporary removal.

SCHEDULE TO AGREEMENT.

Limits of Australia Station.

The Australia Station, as referred to in Article II. of the foregoing agreement, is bounded—

North.—On the north from the meridian of 95° east, by the parallel of the tenth degree of south latitude, to 130° east longitude, thence northward on that meridian to the parallel of 2° north latitude, and thence on that parallel to the meridian of 136° east longitude, thence north to 12° north latitude, and along that parallel to 160° west longitude, thence south to the equator, thence east to the meridian of 149° 30′ west longitude.

West.—On the west by the meridian of 95° east longitude.

South.—On the south by the Antarctic Circle.

East.—On the east by the meridian of 149° 30′ west longitude.

Limits of the China Station.

The China Station, as referred to in Article II. of the foregoing agreement, is bounded—

North.—On the north from the meridian of 95° of east longitude in 10° north latitude, along that parallel to the west coast of the Malay Peninsula, thence by the shores of Asia as far as the meridian of 180°.

West.—On the west from the latitude of 10° north by the meridian of 95° east longitude to 10° of south latitude.

South.—On the south from the meridian of 95° east longitude by the parallel of 10° south latitude to 130° east longitude, thence north to 2° north latitude, and along that parallel to 136° east longitude, thence north to 12° north latitude and along that parallel to the meridian of 180°.

East.—On the east by the meridian of 180° from 12° north latitude to the point where the meridian reaches the shores of Asia.

Limits of East Indies Station.

The East Indies Station, as referred to in Article II. of the foregoing agreement, is bounded—

North.—On the north by the southern shores of Asia, including the Persian Gulf, from an imaginary line drawn from Jebel Sejan, on the African Coast, to Cape Babel Mandeb, on the Arabian Coast, to where the tenth parallel of north latitude touches the west coast of the Malay Peninsula.

East.—On the east by the meridian of 95° east longitude between the parallels of 10° north and 26° south latitude.

South.—On the south by the 10th parallel of north latitude between the coast of the Malay Peninsula and the 95th meridian of east longitude, and by the parallel of 26° south latitude between the 95th and 42nd meridians of east longitude.

West.—On the west by the 42nd meridian of east longitude between the parallels of 26° and 10° south latitude, by the 43rd meridian between the parallel of 10° south and the equator, and by the east coast of Africa between the equator and Jebel Sejan.

From this it will be seen that a very considerable improvement has been arranged, subject to the approval of the Parliaments concerned, in the terms of the Australasian Naval Agreement, by which the effectiveness of the squadron to which it relates as part of the naval force of the Empire will be greatly increased, and the amount of the Colonial contribution towards the maintenance of the squadron will be raised from £126,000 a year, at which it stands at present, to £240,000. At the same time the Premiers of Cape Colony and Natal have intimated their desire to increase their unconditional contributions to the Navy from £30,000 and £12,000 to £50,000 and £35,000 respectively.

Newfoundland also, where a branch of the Royal Naval Reserve was established two years ago, the expense of which was borne entirely on Imperial funds, has now agreed to contribute a sum of £3000 a year towards the charge on the understanding that the number of the reserve there is raised to and maintained at 600 men, and further to contribute a capital sum of £1800 towards the "housing in" of the training ship Calypso, which is to be stationed there. If, as may confidently be expected, these arrangements are accepted by the Parliaments of the Colonies concerned, a considerable forward step in the organisation of the Empire for the protection and defence of the general interests will have been accomplished. Though the aggregate contributions from the Colonies will under the new arrangements be practically doubled, they will still amount to little more than 1 per cent. of the charge for the Navy borne by the taxpayers of the United Kingdom, but the increase, and still more the proposals in the Australasian and Newfoundland agreements, which will add a considerable Colonial element to the *personnel* of the Fleet, are satisfactory as evidence that the self-governing Colonies realise

that the burden of defence is a common burden, and that they feel that the time has come when the unity of sentiment which now knits the Empire together should receive practical expression by their sharing, as far as their circumstances permit, in the task of providing for the defence of the common interests, of which, as the First Lord of the Admiralty pointed out, their proportion is steadily and continuously growing.

Abstract of Navy Estimates for 1903–1904.

Votes.		Estimates, 1903–1904.			Estimates, 1902–1903.			Difference on Net Estimates.		Votes.
		Gross Estimate.	Appropriations in Aid.	Net Estimate.	Gross Estimate.	Appropriations in Aid.	Net Estimate.	Increase.	Decrease.	
	I.—NUMBERS.			Total Numbers.			Total Numbers.	Numbers.	Numbers.	
A.	Total Number of Officers, Seamen, Boys, Coast Guard, and Royal Marines	127,100	....	127,100	122,500	....	122,500	4,600	....	A.
	II.—EFFECTIVE SERVICES.	£	£	£	£	£	£	£	£	
1	Wages, &c., of Officers, Seamen and Boys, Coast Guard, and Royal Marines	6,445,828	133,028	6,312,800	6,079,545	117,545	5,962,000	350,800	....	1
2	Victualling and Clothing for the Navy	2,805,240	512,740	2,292,500	2,512,706	489,206	2,023,500	269,000	....	2
3	Medical Establishments and Services	280,942	21,942	259,000	269,410	22,910	246,500	12,500	....	3
4	Martial Law	15,698	198	15,500	17,892	192	17,700	....	2,200	4
5	Educational Services	152,316	36,216	116,100	133,023	31,323	101,700	14,400	....	5
6	Scientific Services	89,584	20,184	69,400	86,092	20,492	65,600	3,800	....	6
7	Royal Naval Reserves	305,681	8,131	297,500	287,077	177	286,900	10,600	....	7
8	Shipbuilding, Repairs, Maintenance, &c.:									8
	Section I.—*Personnel*	3,013,400	21,600	2,991,800	2,674,415	12,915	2,661,500	330,300	....	Sec. I.
	Section II.—*Matériel*	5,103,800	317,100	4,786,700	5,017,700	205,000	4,812,700	....	26,000	Sec. II.
	Section III.—Contract Work	9,703,500	132,000	9,571,500	7,738,150	72,350	7,665,800	1,905,700	....	Sec. III.
9	Naval Armaments	3,300,964	94,864	3,206,100	3,420,175	63,775	3,356,400	....	150,300	9
10	Works, Buildings, and Repairs at Home and Abroad	1,527,000	25,000	1,502,000	1,128,000	28,000	1,100,000	402,000	....	10
11	Miscellaneous Effective Services	423,638	14,138	409,500	381,663	13,663	368,000	41,500	....	11
12	Admiralty Office	315,400	9,000	306,400	303,300	9,000	294,300	12,100	....	12
	Total Effective Services . . . £	33,482,991	1,346,191	32,136,800	30,049,148	1,086,548	28,962,600	3,352,700	178,500	
	III.—NON-EFFECTIVE SERVICES.									
13	Half-Pay, Reserved, and Retired Pay	797,194	12,894	784,300	794,352	12,252	782,100	2,200	....	13
14	Naval and Marine Pensions, Gratuities, and Compassionate Allowances	1,206,089	19,789	1,186,300	1,182,682	21,982	1,160,700	25,600	....	14
15	Civil Pensions and Gratuities	350,567	467	350,100	350,535	435	350,100	....	....	15
	Total Non-Effective Services . . £	2,353,850	33,150	2,320,700	2,327,569	34,669	2,292,900	27,800	....	
	GRAND TOTAL . . . £	35,836,841	1,379,341	34,457,500	32,376,717	1,121,217	31,255,500	3,380,500	178,500	

Net Increase £3,202,000

STATEMENT showing the Actual and Estimated EXPENDITURE for NAVAL SERVICES for the Three Years ending the 31st March, 1904.

		£	s.	d.
1901–1902.	Estimated Expenditure (after deducting Appropriations in Aid)	30,875,500	0	0
	Supplementary Estimate (29th January, 1902)	200,000	0	0
		31,075,500	0	0
	Net Expenditure, as per Final Account	30,981,315	2	8
	Expenditure less than Estimate	£94,184	17	4
1902–1903.	Estimated Expenditure (after deducting Appropriations in Aid)	£31,255,500	0	0
1903–1904.	Estimated Expenditure (after deducting Appropriations in Aid)	£34,457,500	0	0

STATEMENT of the Principal Points of DIFFERENCE between the ESTIMATES of 1902–1903 and those for 1903–1904.

		£
INCREASES.		
Wages, &c., of Officers, Seamen, and Marines		392,700
Victualling and Clothing		279,440
Medical Establishments and Services		13,630
Martial Law		915
Educational Services		14,880
Scientific Services		4,085
Royal Naval Reserves		28,000
Wages of Artificers and Police in Dockyards		328,533
Naval Stores		71,200
Propelling and Auxiliary Machinery for His Majesty's Ships and Vessels (Contract)		186,590
Hulls of Ships (Contract)		647,736
Purchase of Ships, Vessels, &c.		12,000
Repairs and Alterations by Contract of Ships, &c.		546,729
Inspection of Contract Work		15,250
Gun Mountings (Contract)		543,482
Royal Reserve of Merchant Cruisers		14,813
Wages of Artificers (Naval Ordnance Establishments)		11,420
Guns		43,700
Inspection, Proof, Experiments, &c. (Naval Ordnance Stores)		19,600
Works, Buildings, and Repairs		403,900
Non-Effective Services		26,200
Expiration of Agreement with India in respect of the Floating Defences of Indian Harbours		61,600
Miscellaneous Increases		64,966
		£3,731,369
DECREASES.	£	
Projectiles and Ammunition	183,800	
Torpedoes and Gun-cotton	9,000	
Small Arms, Maintenance of Naval Ordnance Vessels, &c.	9,200	
Increase in amount of Receipts arising from the sale of old Ships and unserviceable Naval Stores and Naval Ordnance Stores	115,100	
Miscellaneous Effective Services	20,800	
Increased contributions by the Colonies in aid of Naval Expenditure	190,000	
Miscellaneous Decreases	1,469	
		529,369
Net Increase		£3,202,000

STATEMENT showing the Total Estimated EXPENDITURE for the NAVAL SERVICE, including Amounts provided in the NAVY ESTIMATES, as well as in the CIVIL SERVICE and other ESTIMATES, for the following Services :—

———		1903–1904.	1902–1903.
NAVY ESTIMATES:		£	£
Estimated Expenditure (after deducting Appropriations in Aid) . .		34,457,500	31,255,500
CIVIL SERVICE ESTIMATES:			
Estimated Expenditure under—			
Class I. Vote 8.—Public Buildings, Great Britain:	£		
Maintenance and Repairs, including New Works, Alterations, &c. .	5,840		
Rents, Insurance, Tithes, &c. . .	10,310		
Fuel, Light, Water, &c. . . .	5,000		
Furniture	4,200		
		25,350	23,330
Class I. Vote 9.—Surveys of the United Kingdom		200	200
„ I. „ 12.—Rates on Government Property		105,000	98,900
„ I. „ 13.—Public Works and Buildings, Ireland:			
Coast Guard, viz.:	£		
Purchase of Sites . . .	450		
New Works and Alterations, including Naval Reserve Stations . .	10,191		
Maintenance and Supplies . .	6,127		
	£16,768		
Naval Reserve, viz.:			
Maintenance and Supplies . .	188		
		16,956	20,351
Class II. Vote 8.—Board of Trade:			
Staff and Incidental Expenses in connection with the Royal Naval Reserve Force . . .		3,598	3,486
„ II. „ 9.—Mercantile Marine Services:			
Staff and Incidental Expenses in connection with the Royal Naval Reserve Force . . .		2,450	2,450
„ II. „ 14.—Exchequer and Audit Department (Cost of Audit):	£		
Navy Cash Accounts . . .	8,400		
Expense and Manufacturing Accounts	5,300		
Store Accounts	5,800		
		19,500	18,526
Class II. Vote 23.—Stationery and Printing		79,000	80,000
„ III. „ 1.—Law Charges, England		6,357	6,316
Maintenance of Naval Prisoners:			
„ III. „ 7.—Prisons, England and the Colonies . . .		5,816	6,550
„ III. „ 13.—Prisons, Scotland		150	120
„ III. „ 20.—Prisons, Ireland		392	256
REVENUE DEPARTMENT ESTIMATES:			
Vote 1.—Customs.—Percentage for provision of funds for District Paymasters of the Coast Guard		131	139
Vote 1.—Customs.—Staff and Incidental Expenses in connection with the Royal Naval Reserve Force		3,311	3,261
Vote 2.—Inland Revenue.—Analysis of Food, &c.		140	140
Vote 3.—Post Office.—Postage of Official Correspondence (including Parcels)	£ 16,974		
Vote 5.—Post Office Telegraphs.—Official Telegrams and Expenses in connection with Telegraphs (Admiralty Wires, and Services of Clerks)	16,810		
		33,784	34,800
Total . . . . £		34,759,635	31,554,355

Note.—In addition to the Services shown above, an annuity of £16,243 18s. is payable to the Commissioners of Woods, &c., from the Consolidated Fund, under the Public Offices Sites Act of 1882 (45 & 46 Vict. c. 32).

STATEMENT showing the CONTRIBUTIONS from INDIA and the COLONIES towards NAVAL EXPENDITURE.

RECEIVED FROM.	NATURE OF SERVICE.	VOTE.													TOTAL.
		1	2	3	7	8			9	11	12	13	14	15	
						Section I.	Section II.	Section III.							
		£	£	£	£	£	£	£	£	£	£	£	£	£	£
India	Maintenance of His Majesty's Ships in Indian Waters . .	28,000	9,100	500	..	12,500	10,200	13,000	11,600	2,500	..	4,300	8,300	..	100,000
	Indian Troop Service (on account of work performed by the Admiralty) . . .	..	..	..	..	..	..	..	..	..	3,050	..	..	350	3,400
Australian Commonwealth New Zealand .	Maintenance of an Australasian Squadron and the establishment of a branch of the Royal Naval Reserve	58,000	18,300	600	5,000	..	30,700	95,000	5,500	7,000	..	8,500	11,400	..	200,000 40,000
Cape Colony . . Natal	General maintenance of the Navy . .	11,100 7,700	4,600 3,200	.. ..	.. ..	4,900 3,400	9,100 6,400	14,100 9,900	6,200 4,400	.. ..	.. ..	.. ..	.. ..	.. ..	50,000 35,000
Newfoundland .	Maintenance of a branch of the Royal Naval Reserve . .	..	..	..	3,000	..	..	..	..	..	..	..	..	..	3,000
	Total . . £	104,800	35,200	1,100	8,000	20,800	56,400	132,000	27,700	9,500	3,050	12,800	19,700	350	431,400

NOTE.—The contributions from the Australian Commonwealth and the Colonies of Natal and Newfoundland are subject to approval by the Colonial Legislatures concerned.

VOTE (A).

NUMBERS of OFFICERS, SEAMEN, BOYS, and ROYAL MARINES Borne on the Books of His Majesty's Ships, and at the ROYAL MARINE DIVISIONS.

One Hundred and Twenty-seven Thousand One Hundred.

I.—SEA SERVICE.

Under which Vote Provided.	RANKS, &c.	NUMBERS, ALL RANKS.				Numbers of all Ranks borne on 1st January, 1903.
		1903–1904.		1902–1903.		
Vote 1	FOR HIS MAJESTY'S FLEET:					
	Flag Officers	20		16		
	Commissioned Officers	4,152		4,048		
	Subordinate Officers	770		764		
	Warrant Officers	1,734		1,641		
	Petty Officers and Seamen	83,009		78,522		
	Boys (Service)	3,700	93,385	3,700	88,691	88,685
	COAST GUARD:					
	Commissioned Officers	89		88		
	Chief Officers of Stations	242		239		
	Petty Officers and Seamen	3,906	4,237	3,873	4,200	4,136
	ROYAL MARINES (for Service Afloat and on Shore):					
	Commissioned Officers	474		471		
	Warrant Officers	32		32		
	Staff Sergeants and Sergeants	1,417		1,417		
	Buglers and Musicians	647		647		
	Rank and File	17,010	(a) 19,580	17,022	19,589	19,579
	Total		117,202		112,480	112,400
	Net Increase		4,722			

(a) Including 12 officers, Sub-Head H.

VOTE (A.)—*continued.*

II.—OTHER SERVICES.

Under which Vote Provided.	RANKS, &c.	NUMBERS, ALL RANKS. 1903–1904.		NUMBERS, ALL RANKS. 1902–1903.		Numbers of all Ranks borne on 1st January, 1903.
Vote 1	Naval Cadets	440		305		
Vote 1	Engineer Cadets	172		187		
Vote 1	Pensioners in Home Ships and in the Reserves, &c.	813		1,282		
Vote 1	Boys under Training	6,200	(b) 7,625	6,200	7,974	8,201
Vote 2	For Victualling and Clothing for the Navy	58		59		
Vote 3	For Medical Establishments and Services	544		475		
Vote 4	For Martial Law	29		28		
Vote 5	For Educational Services	269		214		
Vote 6	For Scientific Services	6		8		
Vote 8	For Shipbuilding, Repairs, Maintenance, &c.					
	Section I.	831		813		
	Section II.	70		6		
	Section III.	64		34		
Vote 9	For Naval Armaments	256		263		
Vote 10	For Works, Buildings, and Repairs, at Home and Abroad	105		107		
Vote 11	For Miscellaneous Effective Services	1		1		
Vote 12	For Admiralty Office	40	2,273	38	2,040	2,065
	Total		(c) 9,898		10,020	10,266
	Net Increase		122			
	Total, Sea Service	117,202		112,480		
	" other Services	9,898	127,100	10,020	122,500	
	Net Increase		4,600			

(b) Including 11 officers, Sub-Head H.

(c) Including	1903–1904		1902–1903
Officers and Seamen	1,999	..	1,730
" Pensioners (Vote 1)	802	..	1,272
" Pensioners (other Votes)	15	..	16
" Boys (Training, Seamen Class)	6,200	..	6,200
" Boys (Training, Artizans)	656	..	586
" Royal Marines	226	..	216
	9,898	..	10,020

VOTE 8.

SHIPBUILDING, REPAIRS, MAINTENANCE, &c.

I.—ESTIMATE of the SUM which will be required, in the YEAR ending 31st March, 1904, to defray the EXPENSES of SHIPBUILDING, REPAIRS, MAINTENANCE, &c., including the COST of ESTABLISHMENTS of DOCKYARDS and NAVAL YARDS at HOME and ABROAD.

DOCKYARD WORK.

SECTION I.—PERSONNEL.—Two Million Nine Hundred and Ninety-One Thousand Eight Hundred Pounds.
(£2,991,800.)

SECTION II.—MATÉRIEL.—Four Million Seven Hundred and Eighty-Six Thousand Seven Hundred Pounds.
(£4,786,700.)

CONTRACT WORK.

SECTION III.—CONTRACT WORK.—Nine Million Five Hundred and Seventy-one Thousand Five Hundred Pounds.
(£9,571,500.)

II.—SUB-HEADS under which SECTION I., PERSONNEL, of this VOTE will be accounted for.

———	ESTIMATES. 1903–1904.	ESTIMATES. 1902–1903.	Increase.	Decrease.
	£	£	£	£
DOCKYARD WORK.				
SECTION I.—PERSONNEL.				
Dockyards at Home.				
A.—Salaries and Allowances	(*a*) 203,154	192,609	10,545	..
B.—Wages, &c., of Men, and hire of Teams	2,312,036	2,037,765	274,271	..
C.—Wages, &c., of Police Force	45,058	44,028	1,020	..
D.—Contingencies	2,200	7,400	..	5,200
Naval Yards Abroad.				
E.—Salaries and Allowances	(*a*) 96,184	90,477	5,707	..
F.—Wages, &c., of Men, and hire of Teams	335,144	285,476	49,668	..
G.—Wages, &c., of Police Force	18,834	15,260	3,574	..
H.—Contingencies	800	1,400	..	600
£	3,013,400	2,674,415	344,785	5,800
Deduct,—				
I.—Appropriations in Aid	21,600	12,915	8,685	..
£	2,991,800	2,661,500	336,100	5,800
		Net Increase	£330,300 (*b*)	

(*a*) These amounts include the sums of £32,409 and £9,856 for pay of Inspectors of Trades at Home and Abroad respectively, which is charged direct to the cost of shipbuilding.
(*b*) This Vote is decreased by a transfer of £8,120 to Vote 11. There is, therefore, a real increase of £338,420.

Note.—Provision has been made for New Construction in the above Vote to the extent of—

	£
Section 1	923,150
„ 2	1,087,172
„ 3	8,126,108
	£10,136,430

Vote 8.—Shipbuilding, Repairs, Maintenance, &c.—*continued.*

II.—Sub-Heads under which Section II., Matériel, of this Vote will be accounted for.

	Estimates. 1903–1904.	Estimates. 1902–1903.	Increase.	Decrease.
	£	£	£	£
DOCKYARD WORK—*continued.*				
Section II.—Matériel.				
Naval Stores, &c.				
A.—Timber, Masts, Deals, &c.	163,000	140,000	23,000	..
B.—Metals and Metal Articles	1,469,900	1,799,700	..	329,800
C.—Coal for Yard purposes	116,500	105,000	11,500	..
D.—Hemp, Canvas, &c.	263,000	261,000	2,000	..
E.—Paint Materials, Oils, Pitch, Tar, Tallow, Boats, Furniture, and other Miscellaneous Articles	761,500	646,500	115,000	..
F.—Electrical, Torpedo, and other Apparatus	347,500	315,000	32,500	..
G.—Freight	80,000	75,000	5,000	..
H.—Rents, Water, &c., Dockyards at Home, and Naval Yards Abroad	39,900	37,340	2,560	..
I.—Gas, &c., Dockyards at Home and Naval Yards Abroad	18,500	17,160	1,340	..
Coal for the Fleet.				
K.—Coal, &c., for the Fleet	1,844,000	1,621,000	223,000	..
£	5,103,800	5,017,700	415,900	329,800
Deduct—				
L.—Appropriations in Aid	317,100	205,000	112,100	..
£	4,786,700	4,812,700	303,800	329,800
	Net Decrease		£26,000	

VOTE 8.—SHIPBUILDING, REPAIRS, MAINTENANCE, &C.—*continued.*

II.—SUB-HEADS under which SECTION III., CONTRACT WORK, of this VOTE will be accounted for.

———	ESTIMATES.		Increase.	Decrease.
	1903–1904.	1902–1903.		
SECTION III.—CONTRACT WORK.	£	£	£	£
A.—Propelling Machinery for His Majesty's Ships and Vessels	3,439,121	3,287,330	151,791	..
B.—Auxiliary Machinery for His Majesty's Ships and Vessels	168,043	133,244	34,799	..
C.—Hulls of Ships, &c., Building by Contract	3,671,636	3,023,900	647,736	..
D.—Purchase of Ships, Vessels, &c.	12,000	..	12,000	..
E.—Repairs and Alterations by Contract of Ships, &c., and their Machinery and Stores	722,250	175,521	546,729	..
F.—Inspection of Contract Work	70,000	56,000	14,000	..
G.—Gun Mountings and Air-Compressing Machinery	1,354,330	810,848	543,482	..
H.—Machinery for His Majesty's Shore Establishments at Home and Abroad	188,307	188,307	..	..
I.—Royal Reserve of Merchant Cruisers.	77,813	63,000	14,813	..
£	9,703,500	7,738,150	1,965,350	..
Deduct— K.—Appropriations in Aid	132,000	72,350	59,650	..
£	9,571,500	7,665,800	1,905,700	..
	Net Increase		£1,905,700 (*a*)	

(*a*) This Vote is decreased by a transfer of £1,250 to Vote 11. There is, therefore, a real increase of £1,906,950.

PROGRAMME of the ESTIMATED EXPENDITURE in CASH, and in NET
REPAIRS, MAINTENANCE, &c.,
(Exclusive of the FLEET

SUB-HEADS under which this ESTIMATED EXPENDITURE will be
provisions of Section 1 (2), ARMY

	ESTIMATED EXPENDITURE IN				
	Direct Expenditure.				
	Dockyard Work.		Contract Work, Sec. III.	Total Direct Expenditure. (A)	
	Personnel, Sec. I.	Matériel, Sec. II.			
	£	£	£	£	
NEW CONSTRUCTION:					
A.—DOCKYARD-BUILT SHIPS—					
Hulls, &c. (c)	808,550	(f) 993,772	554,313	2,356,635	1
Machinery	36,000	10,000	689,246	735,246	2
	844,550	1,003,772	1,243,559	3,091,881	3
B.—CONTRACT-BUILT SHIPS—					
Hulls, &c. (c)	77,550	82,600	(g) 4,296,010	4,456,160	4
Machinery	..	..	2,577,839	2,577,839	5
	77,550	82,600	6,873,849	7,033,999	6
C.—SMALL VESSELS (d)	1,050	800	8,700	10,550	7
TOTAL NEW CONSTRUCTION	923,150	1,087,172	8,126,108	(e) 10,136,430	8
D.—RE-CONSTRUCTION, REPAIRS, ALTERATIONS, &c.	1,102,425	(h) 614,250	1,139,333	2,856,008	9
E.—SEA STORES, &c.	..	1,038,975	24,211	1,063,186	10
F.—ESTABLISHMENT, INCIDENTAL, AND MISCELLANEOUS CHARGES, UNAPPROPRIATED	..	..	..	..	11
TOTAL £	2,025,575	2,740,397	9,289,652	14,055,624	12

(c) Including Hydraulic and Transferable Gun Mountings, &c.
(d) Including Harbour Craft, and excluding Torpedo Boats, &c., the value of which is included under other Sub-Heads.
(e) Exclusive of £58,000 provided under Vote 2 for new Tank Vessels and Lighters for Victualling Yard Service; also £15,478 provided under Vote 9 for new Vessels for Naval Ordnance Store Service, and £85,500 for Coaling Craft, Vote 8, Section 2, Sub-Head K.
(f) Including £5 8,000 for Armour. (g) Including £1,110,000 for Armour. (h) Including £45,000 for Armour.

VALUES OF STORES issued for SHIPBUILDING, RE-CONSTRUCTION, in the Year 1903–1904.
COALING SERVICE.)
accounted for in the NAVY EXPENSE ACCOUNTS, under the AND NAVY AUDIT ACT, 1889.

	1903–1904.		EXPENDITURE AS ESTIMATED IN NAVY ESTIMATES, 1902–1903.			Difference between Direct Expenditure, 1902–1903 (B) and 1903–1904 (A).	
	Establishment, &c., Charges, apportioned.	Aggregate, 1903–1904.	Direct Expenditure. (B)	Establishment, &c., Charges, apportioned.	Aggregate, 1902–1903.	Increase.	Decrease.
	£	£	£	£	£	£	£
1	247,530	2,604,165	(i) 2,051,644	227,484	2,279,128	304,991	..
2	20,420	755,666	1,054,795	28,347	1,083,142	..	319,549
3	**267,950**	**3,359,831**	**3,106,439**	**255,831**	**3,362,270**	..	**14,558**
4	97,410	4,553,570	(k) 3,725,337	124,874	3,850,211	730,823	..
5	38,760	2,616,599	2,147,122	32,207	2,179,329	430,717	..
6	**136,170**	**7,170,169**	**5,872,459**	**157,081**	**6,029,540**	**1,161,540**	..
7	220	10,770	79,622	1,697	81,319	..	69,072
8	**404,340**	**10,540,770**	**9,058,520**	**414,609**	**9,473,129**	**1,077,910**	..
9	300,000	3,156,008	(l) 1,974,465	221,063	2,195,528	881,543	..
10	84,300	1,147,486	978,756	75,458	1,054,214	84,430	..
	788,640						
11	1,609,883	1,609,883	..	1,501,741	1,501,741	..	.
12	**2,398,523**	**16,454,147**	**12,011,741**	**2,212,871**	**14,224,612**	..	..

NET INCREASE ON DIRECT EXPENDITURE . . £2,043,883.

(i) Including £549,027 for Armour.
(k) Including £812,313 for Armour.
(l) Including £[illegible]9,183 for Armour.

RECAPITULATION OF ESTIMATED EXPENDITURE.

DESCRIPTION OF EXPENDITURE.	DOCKYARD WORK. LABOUR. Dockyards at Home.	DOCKYARD WORK. LABOUR. Dockyards Abroad, &c.	DOCKYARD WORK. MATERIALS (NET). Dockyards at Home.	DOCKYARD WORK. MATERIALS (NET). Dockyards Abroad, &c.	CONTRACT WORK.	OTHER ESTABLISHMENT AND INCIDENTAL CHARGES. Dockyards at Home.	OTHER ESTABLISHMENT AND INCIDENTAL CHARGES. Dockyards Abroad, &c.	TOTAL.
	£	£	£	£	£	£	£	£
Direct Expenditure, including "Manufactures"	1,932,825	218,150	(b) 2,278,697	(b) 461,700	9,289,652	..	..	14,181,024
Establishment and Incidental Charges	368,050	120,550	245,650	75,100	336,120	820,494	432,559	2,398,523
TOTAL £	(a) 2,300,875	(a) 338,700	2,524,347	536,800	9,625,772	820,494	432,559	16,579,547

Deduct—Value of Labour to be expended upon the Manufacture of Stores, included in the values of materials to be issued	125,400
TOTAL ESTIMATED EXPENDITURE £	16,454,147

	Dockyards at Home.	Dockyards Abroad.
	£	£
(a) TOTAL VOTE 8, Section 1, Sub-heads B and F	2,312,036	335,144
Add—Salaries of Inspectors of Trades	32,409	9,856
	2,344,445	345,000
Abate—Additional sums provided in the Vote to meet the difference in the periods covered by the Financial year 1903–1904, and the 53 weekly payments which fall due in that year	43,570	6,300
TOTAL	£2,300,875	338,700

(b) Exclusive of an estimated expenditure of £89,550 dockyards at home, and £14,450 dockyards abroad, for supplies to other departments of the Home, Indian, Colonial and Foreign Governments, Private Individuals, &c., on repayment; and of Stores to be sold, included in the Appropriations in aid of Vote 8, Section 2.

DIAGRAM SHEWING THE ACTUAL EXPENDITURE UPON THE CONSTRUCTION OF NEW SHIPS. DURING THE 32 YEARS BETWEEN 1872-73. & 1903-4.

FINANCIAL YEAR.

1872-3. 1873-4. 1874-5. 1875-6. 1876-7. 1877-8. 1878-9. 1879-80. 1880-1. 1881-2. 1882-3. 1883-4. 1884-5. 1885-6. 1886-7. 1887-8. 1888-9. 1889-90. 1890-1. 1891-2. 1892-3. 1893-4. 1894-5. 1895-6. 1896-7. 1897-8. 1898-9. 1899-0. 1900-1. 1901-2. 1902-3. 1903-4.

EXPENDITURE £.

10,000000. 9,000000. 8,000000. 7,000000. 6,000000. 5,000000. 4,000000. 3,000000. 2,000000. 1,000000.

(a) Includes £ 1,523,000. for purchase of Ships under the Vote of Credit.
(b) Includes Expenditure under Lord Northbrook's Special Programme.
(c) Includes Expenditure under the Defence Acts of 1888 and 1889.

Hanhart lith.

LIST of NEW SHIPS and VESSELS Estimated to be Passed into the FLEET RESERVE during the Years 1903–1904 and 1902–1903.

1903–1904.				1902–1903.			
NAME OF SHIP.	Load Displacement in Tons.	Indicated Horse Power.	Number of Guns.	NAME OF SHIP.	Load Displacement in Tons.	Indicated Horse Power.	Number of Guns.
ARMOURED SHIPS.				**ARMOURED SHIPS.**			
Prince of Wales . .	15,000	15,000	16	London	15,000	15,000	16
Queen	15,000	15,000	16	Venerable . . .	15,000	15,000	16
Albemarle . . .	14,000	18,000	16	Montagu. . . .	14,000	18,000	16
Cornwallis . . .	14,000	18,000	16	Russell	14,000	18,000	16
Duncan	14,000	18,000	16	Vengeance . . .	12,950	13,500	16
Exmouth	14,000	18,000	16	Drake	14,100	30,000	18
Euryalus	12,000	21,000	14	Good Hope . . .	14,100	30,000	18
Bedford	9,800	22,000	14	King Alfred . . .	14,100	30,000	18
Cornwall	9,800	22,000	14	Leviathan . . .	14,100	30,000	18
Essex	9,800	22,000	14	Bacchante . . .	12,000	21,000	14
Monmouth . . .	9,800	22,000	14	Hogue	12,000	21,000	14
Suffolk	9,800	22,000	14	Sutlej	12,000	21,000	14
Donegal	9,800	22,000	14	Kent	9,800	22,000	14
Lancaster . . .	9,800	22,000	14				
Berwick	9,800	22,000	14				
Cumberland . . .	9,800	22,000	14				
PROTECTED SHIPS.				**PROTECTED SHIPS.**			
Challenger . . .	5,880	12,500	11	Spartiate . . .	11,000	18,000	16
UNPROTECTED SHIPS.				**UNPROTECTED SHIPS.**			
Cadmus	1,070	1,400	6	Assistance . . .	9,600	*4,200 (Howden's)	..
Clio	1,070	1,400	6	Aquarius . . .	2,800	1,100	..
				Fantôme . . .	1,070	1,400	6
				Merlin	1,070	1,400	6
				Odin	1,070	1,400	6
TORPEDO BOAT DESTROYERS 4 No. .	various			TORPEDO BOAT DESTROYERS 4 No.	various		..
TORPEDO BOATS 8 No.	..	..	..	TORPEDO BOATS 3 „	..	..	..
SUBMARINE BOATS . 5 No.	..	..	..	SUBMARINE BOATS 4 „	..	..	..

* Forced draught.

Austria-Hungary, Navy Estimates, 1903.

Ordinary Estimates.

	£	s.
Pay of officers, etc.	174,331	12
Pay of petty officers and seamen, with clothing	127,940	8
Land service	73,686	13
Sea	181,874	12
Establishments :—		
Hydrographical Office and Naval Library	2,905	0
Naval Academy	8,191	8
" lower-grade schools	223	15
" hospitals	8,759	12
Maintenance of the Fleet :—		
Dockyards, repairs, and *matériel*	303,731	5
New Ships and Machinery :—		
Fifth and last Vote out of a total vote of £144,916 13s. for torpedo-cruiser "Szigetvár" (C), of 2,350 tons displacement, Ersatz "Fasana"	2,575	8
Fourth Vote out of a total vote of £491,043 15s. for ram-cruiser E, of 7,300 tons displacement, Ersatz "Radetzky"	108,333	4
Third Vote out of a total vote of £725,000 for battleship A, of 10,600 tons displacement, Ersatz "Laudon"	158,333	7
Second Vote out of an approximate total vote of £725,000 for battleship B, of 10,600 tons displacement, Ersatz "Drache"	116,666	13
Ordnance, etc.	51,166	13
Miscellaneous expenses	142,691	13
Apparent total	1,461,414	3
Certain deductions	10,208	7
Real total	1,451,205	16

Extraordinary Estimates.

	£	s.
Certain expenses in connection with Naval Academy, ships' libraries, charts, etc.	1,036	13
Maintenance of the Fleet—New Ships and Machinery:—		
Second Vote out of a total vote of £187,500 for a steel floating dock	91,666	13
Sixth and last Vote out of a total vote of £505,158 15s. for coast-defence battleship "Habsburg," of 8,340 tons displacement	2,500	0
Fifth Vote out of a total vote of £531,517 18s. for coast-defence battleship "Arpad," of 8,340 tons displacement	29,166	13
Fourth Vote out of a total vote of £537,708 7s. for coast-defence battleship "Babenburg," of 8,340 tons displacement	158,334	0
Second Vote out of an approximate total vote of £141,666 13s. for two Danube monitors and five patrol-boats	31,250	0
Ordnance—Guns, gun-mountings, ammunition, torpedoes, submarine mines, etc.:—		
Fourth and last Vote for armament of coast-defence battleship "Habsburg"	6,666	13
Fourth and last Vote for armament of coast-defence battleship "Arpad"	23,541	13
Third Vote for armament of coast-defence battleship "Babenberg"	41,666	13
Third Vote for armament of ram-cruiser E	29,188	13
First Vote for armament of battleship A	37,500	0
Vote for 8-mm. machine guns and revolvers	3,000	0
Votes for ammunition, etc., for "Szigetvár," "Habsburg," "Arpad," "Babenberg," "E," and for 15-cm. Q.F. guns	88,750	0
Submarine mines	2,083	7
Torpedoes and torpedo-nets	7,500	0
Workshops, buildings, and other works	25,061	13
Expenses in connection with the Guard detachment in China	9,499	3
Miscellaneous	1,666	13
Total	590,078	7

French Navy Estimates, 1903.

Cap. in Estimates. 1903.	Heads of Expenditure.	Credits voted for 1903.	Credits voted for 1902.
		£	£
	PERSONNEL.		
1, 2	Admiralty Office	135,134	139,795
5, 6, 7	Navy Pay	1,928,405	1,952,982
—	Marines	—	61,836
—	Gendarmerie Maritime	—	27,804
8	Inspection of Administrative Services .	12,438	11,413
9, 10	Construction and Ordnance Staff . .	288,200	226,017
11, 13, 14	Administrative Staff, Commissariat, and Inscription Maritime* . . .	290,745	265,753
12	Medical and Religious Staff . . .	75,920	75,985
52	Fisheries and Navigation . . .	28,052	28,052
	LABOUR.		
	Wages—		
25	Shipbuilding; new construction; fitting for sea	481,762	476,127
27	Shipbuilding; repairs	202,061	201,960
29	Master-attendants' and Storekeepers' Departments	251,779	246,933
33	Armaments; construction of new guns .	101,166	127,236
37	Armaments; repairs	70,000	68,100
43	Works	26,691	26,691
—	Submarine defences	—	25,203
17	Victualling	33,189	34,389
19	Hospitals and Miscellaneous . .	14,366	14,387
	MATÉRIEL.		
	Stores and Supplies—		
3	Admiralty	9,960	9,990
26	Shipbuilding in Dockyards . . .	1,600,000	1,561,315
31, 32	Shipbuilding by contract . . .	1,964,000	1,525,959
28, 30	Fitting for sea; maintenance; repairs .	650,788	768,987
	Carried forward . .	£8,164,656	£7,876,944

* The item Administrative Staff of Inscription Maritime is included for the first time.

Cap. in Estimates 1903.	Heads of Expenditure.	Credits voted for 1903.	Credits voted for 1902.
		£	£
	Brought forward - -	8,164,656	7,876,914
	MATÉRIEL—*continued.*		
	Stores and Supplies—*continued.*		
23, 24	Repairs, conversions, &c., in dockyards and by contract	613,480	651,842
34, 35 36, 38	Armaments; new guns and conversions; Powder, ammunition, repairs, tools, &c.	993,661	1,052,040
39, 40 41	Torpedoes	206,645	178,056
44	Works; new and large alterations. .	119,600	144,069
45	Ditto; deepening of the Charente .	10,000	10,000
42, 46	Ditto, supplementary for defence of military ports	605,600	439,854
47, 48	Works; repairs	63,967	63,724
4	Hydrographic Service	19,264	20,864
15	Clothing	155,014	151,848
—	Barracks	—	5,149
16, 18	Victualling	811,591	831,852
20	Hospitals, &c.	77,704	79,304
49, 50	Fuel, lighting, office furniture, printing, &c.	39,485	43,212
	MISCELLANEOUS.		
21, 22	Travelling expenses, freight, allowance for lodgings, &c.	142,920	198,222
51	Charitable and subscriptions . . .	37,150	39,199
53, 54	Fisheries and Commerce (materials for protection, &c.)	13,660	14,860
55	Pensions	460,461	466,908
56	Secret Service	4,000	4,000
	Total . . .	£12,538,858	£12,271,947

Programme of New Construction, to be continued or undertaken in 1903.—Building in Dockyards.

Class.	Names of Ships.	Where Building.	Date of Commencement.	Proposed Date of Completion.	Estimated Cost.	Probable Expenditure in 1903.
					£	£
Battleships	République	Brest	1901	1905	1,431,013	253,240
	Démocratie (ex A. 12)	„	1902	1907	1,431,013	239,360
	Henri IV.	Cherbourg	1897	1903	747,985	18,383
	Suffren	Brest	1899	1903	1,075,008	14,080
Armoured Cruisers, First-class	Jules Ferry	Cherbourg	1901	1906	1,082,891	203,866
	Léon Gambetta	Brest	1901	1904	1,144,211	228,049
	Victor Hugo	Lorient	1901	1906	1,118,648	270,808
	Jules Michelet (ex C. 14)	„	1902	1907	1,082,891	215,111
	Jeanne d'Arc (ex C. 2)	Toulon	1896	1903	891,440	1,688
	Dupetit-Thouars	„	1899	1904	789,574	101,024
	Gueydon	Lorient	1898	1903	757,303	11,981
	Condé	„	1901	1904	870,736	109,998
	Gloire	„	1899	1903	816,164	86,208
	La Marseillaise	Brest	1900	1903	808,513	47,275
	Dupleix	Rochefort	1899	1903	671,939	49,555
	Jurien de la Gravière	Lorient	1897	1903	413,543	840
Torpedo-gunboats and Destroyers	Carabine	Rochefort	1901	1903	63,922	11,739
	Sarbacane	„	1901	1903	63,961	19,318
	Francisque	„	1901	1904	60,481	25,852
	Sabre	„	1901	1904	60,481	23,500
	Stylet (ex M. 32)	„	1902	1905	60,481	22,945
	Tromblon (ex M. 33)	„	1902	1905	60,481	20,691
	M. 34	„	1903	1905	60,481	2,826
	M. 35	„	1903	1906	60,481	2,553
	M. 36	„	1903	1905	60,481	2,400
	M. 37	„	1903	1905	60,481	2,400
	Flamberge	„	1901	1903	59,012	6,598
	Rapière	„	1901	1903	59,012	5,210
	Pertuisane	„	1900	1902	55,048	4,810
	Escopette	„	1900	1903	53,885	4,960
				Carried forward . . . . £	16,001,560	2,007,321

Programme of New Construction, to be continued or undertaken in 1903.—Building in Dockyards—*continued.*

Class.	Names of Ships.	Where Building.	Date of Commencement.	Proposed Date of Completion.	Estimated Cost.	Probable Expenditure in 1903.
					£	£
			Brought	forward .	16,001,560	2,007,321
Submarines and Submersibles	Naïade	Cherbourg	1902	1903	13,300	1,857
	Protée	„	1902	1903	13,300	2,387
	Perle	Toulon	1902	1903	13,300	4,050
	Esturgeon	„	1902	1903	13,300	4,172
	Bonite	„	1902	1903	13,300	4,317
	Thon	„	1902	1903	13,300	4,439
	Souffleur	„	1902	1903	13,300	6,852
	Dorade	„	1902	1903	13,300	6,856
	Lynx	Cherbourg	1902	1903	13,298	5,297
	Ludion	„	1902	1903	13,298	5,702
	Loutre	Rochefort	1901	1903	13,298	4,498
	Castor	„	1901	1904	13,298	7,668
	Phoque	„	1901	1904	13,298	2,825
	Otarie	„	1901	1904	13,298	4,967
	Méduse	„	1901	1904	13,298	5,498
	Oursin	„	1901	1905	13,298	3,427
	Grondin	Toulon	1902	1904	13,298	6,265
	Anguille	„	1901	1904	13,298	6,985
	Alose	„	1901	1904	13,298	8,305
	Truite	„	1901	1904	13,298	8,225
	Lutin	Rochefort	1902	1903	30,543	720
	X. (ex Q. 35)	Cherbourg	1902	1904	29,085	10,320
	Z. (ex Q. 36)	Rochefort	1901	1904	29,638	7,180
	Y. (ex Q. 37)	Toulon	1902	1903	34,147	8,848
	56 (ex Q. 40)	..	..	1905	50,421	14,421
	Aigrette (ex Q. 38)	Toulon	1902	1904	32,369	12,741
	Cigogne (ex Q. 39)	„	1902	1904	32,369	12,306
	Q. 41 to Q. 58 (18 in Number)	Toulon and Cherbourg	..	1905	564,591	55,354
First-class Torpedo-boats	8. S. (ex P. 96)	Saigon	1901	1903	19,950	8,971
	9. S. (ex P. 112)	„	1902	1904	19,950	14,445
	P. 138	„	1903	1905	19,950	4,458
	224 (ex P. 32)	Cherbourg	1900	1903	17,956	2,017
	226 (ex P. 34)	Toulon	1898	1903	16,732	597
				Total building in Dockyards, 1903 .. £	17,165,240	2,261,291

PROGRAMME OF NEW CONSTRUCTION, TO BE CONTINUED OR UNDERTAKEN IN 1903.—BUILDING BY CONTRACT.

Class.	Names of Ships.	Places of Building and Completion.	Date of Contract.	Date of Completion	Total Estimated Cost.	Expenditure proposed for 1903.
					£	£
Battleships	Patrie . . .	La Seyne—Toulon . .	1901	1906	1,602,048	535,381
	Liberté (ex A.11)	St. Nazaire—Brest . .	1902	1906	1,573,402	327,046
	Justice (ex A.13)	La Seyne—Toulon . .	1902	1906	1,580,962	94,514
	Vérité (ex A. 14)	Bordeaux—Brest or Toulon	1902	1907	1,589,042	94,514
Armoured Cruisers First-class	Ernest Renan (ex C. 15)	..	1903	1907	1,317,959	87,182
	Sully . . .	La Seyne—Toulon . .	1899	1903	987,430	113,029
	Amiral Aube .	St. Nazaire-Cherbourg .	1899	1903	1,009,338	237,512
	Desaix . . .	" "	1897	1903	764,652	107,620
	Kléber . . .	Bordeaux—Cherbourg .	1897	1903	775,326	130,525
	Châteaurenault.	La Seyne—Toulon . .	1895	1902	636,114	59,656
Destroyers	Arquebuse . .	Le Havre—Cherbourg .	1900	1903	73,537	24,067
	Arbalète . .	" "	1900	1903	73,537	34,459
	Mousquet . .	Nantes—Lorient. . .	1900	1903	68,764	31,909
	Javeline . . .	" "	1900	1903	68,764	31,917
	Sagaïe . . .	Le Havre—Cherbourg .	1900	1903	69,259	21,156
	Epieu . . .	" "	1900	1903	69,257	31,989
	Harpon . . .	Bordeaux—Rochefort .	1900	1903	70,370	10,660
	Fronde . . .	" "	1900	1903	70,370	21,931
	Dard	Rouen—Cherbourg . .	1901	1904	67,744	35,825
	Baliste . . .	" "	1901	1904	67,744	34,002
	Mousqueton	Chalon—Toulon. . .	1901	1904	67,784	26,025
	Arc	" "	1901	1903	67,784	32,963
	Pistolet . . .	Nantes—Lorient . .	1901	1903	67,979	32,681
	Bélier . . .	" "	1901	1904	67,979	26,233
	Catapulte . .	Le Havre—Cherbourg .	1901	1903	68,384	33,766
	Bombarde . .	" "	1901	1904	68,384	26,966
First-class Torpedo Boats	256 to 276 (ex P. 85 to P. 95	Various	1901	1902–3	211,483	44,596
	278 to 293 (ex P. 98 to P.113)	..	1901–2	1904	315,196	99,383
	P. 114 to P. 137) (24 boats)	..	1903	1905	456,824	37,706
	243 (ex P. 62)	Le Havre—Cherbourg .	1898	uncertain	20,541	5,346
Torpedo Scout .	Libellule . .	" "	1899	uncertain	13,600	7,204
Total building by contract, 1903					£13,961,557	2,437,766

German Navy Estimates, 1903.

(Converted at £1 = 20·43 marks.)

ORDINARY PERMANENT ESTIMATES.

———	Proposed for the financial year 1903.	Granted for the financial year 1902.
	£	£
Imperial Naval Office	86,382	80,481
Observatories	16,613	16,735
Accounts	20,448	19,512
Martial Law	5,282	4,735
Divine Service and Schools	5,125	4,918
Military *Personnel*	1,026,530	953,948
Maintenance of the Fleet	1,172,375	1,075,305
Victualling	73,396	69,676
Clothing	17,509	17,346
Barrack Administration, Cashiers and Accountants	58,975	57,507
Lodging Allowance	157,947	146,490
Medical	74,679	69,984
Travelling Expenses, Freight Charges, &c.	145,415	127,273
Training Establishments	16,935	15,880
Dockyard Expenses	1,178,284	1,116,160
Ordnance and Fortification	396,823	366,212
Accountant-General's Department	32,127	28,704
Pilotage and Surveying Services	28,818	26,628
Miscellaneous Expenses	57,868	54,068
Administration of Kiau-chau Protectorate	3,515	2,648
Total of Ordinary Permanent Estimates carried to next page £	4,575,046	4,254,210

Special Ordinary Estimates.

Shipbuilding Programme for the Financial Year 1903.

For the Construction of—

		£
Battleship Mecklenburg (F), 4th and final instalment		244,738
" Schwaben (G),	"	244,738
" Braunschweig (H), 3rd instalment		227,606
" J.	"	227,606
Large cruiser Friedrich Carl (Ersatz König Wilhelm)	3rd and final instalment	249,143
Small cruiser Frauenlob (G)	"	16,642
" Arcona (H)	"	16,642
" Undine (J)	"	16,642
Alteration of vessels of Siegfried class	"	210,475
Battleship K	2nd instalment	261,870
" L	"	261,870
Large cruiser Ersatz Kaiser	"	205,580
Small cruiser K	"	117,474
" L	"	117,474
" Ersatz Zieten	"	117,474
Gunboat B, 2nd and final instalment		39,158
Alteration of battleships of the Brandenberg class	2nd instalment	59,961
Battleship M	1st instalment	127,263
" N	"	127,263
Large cruiser Ersatz Deutschland	"	156,632
Small cruiser M	"	59,961
" Ersatz Merkur	"	59,961
One Torpedo-boat Division, 2nd and final instalment		104,748
One " "	1st instalment	151,742
Other items		217,820
	Total	£3,640,483

Summary.

—	Proposed for the financial year 1903.	Granted for the financial year 1902.
	£	£
Ordinary Permanent Estimates	4,575,046	4,254,210
Shipbuilding	3,640,483	3,679,197
Armaments and Torpedo Equipments	1,482,427	1,362,995
Other items	261,667	345,989
Extraordinary Expenditure	927,559	391,581
Total £	10,887,182	10,033,974

Italian Navy Estimates, 1903-1904.

FINANCIAL YEAR 1ST JULY, 1903, TO 30TH JUNE, 1904.

Converted at £1 = 27 lire.

——	Proposed for 1903–1904.	Revised Estimates, 1902–1903.
ORDINARY EXPENDITURE—GENERAL EXPENSES.	£	£
Admiralty	54,352	51,621
Pensions	207,111	207,111
Expenditure on various services connected with the Mercantile Marine	354,826	353,553
Total £	616,289	612,285
EXPENDITURE FOR NAVAL SERVICES.	£	£
Ships fitting out, &c.	224,815	224,815
General Staff of the Navy	135,556	130,370
Corps of Constructors	50,037	49,928
Commissariat Service	30,333	30,704
Medical Service	25,556	25,260
Wages—Men	466,667	459,260
Gratuities	78,000	72,296
Assistants to Constructors and others	56,111	54,940
Accountants, &c.	55,038	53,852
Police	10,481	11,326
Telegraph Service	9,000	9,037
" Materials	10,815	6,555
Forts—*Personnel*	12,964	12,964
Victualling	311,111	300,000
Lighting	7,667	7,704
Hospital Services	20,296	20,296
Honorary Distinctions	555	555
Fuel and Stores, for Ships in Commission	285,185	255,555
Salaries and Wages—Workshops and Fortifications	3,994	4,130
Training Establishments	12,122	13,037
Naval Academy	2,516	3,625
Scientific Services—*Personnel*	1,387	1,374
" " *Matériel*	9,444	9,444
Law Charges	1,185	1,185
Travelling Expenses	22,222	22,222
Transport of Materials	4,629	4,629
Carried forward £	1,847,686	1,785,063

——	Proposed for 1903–1904.	Revised Estimates, 1902–1903.
	£	£
Brought forward	1,847,686	1,785,063
Materials for repair of existing Ships	206,667	207,926
Labour for maintenance of Hulls and Machinery . .	193,185	211,705
Materials for maintenance of Ships and Armaments . .	142,592	151,852
Guns, Torpedoes and Small Arms	81,481	81,481
Labour for construction and repair of Armaments . .	74,928	82,334
Works Department—Repairs	92,592	92,592
Construction and Completion of the following:—		
First-class Battleships: Benedetto Brin, at Naples; Regina Margherita, Regina Elena, and A (Vittorio Emanuele class), at Spezia; Vittorio Emanuele and B (of same class), at Castellamare	829,630	829,630
Armoured Cruiser: Francesco Ferrucio, at Venice .		
Three Submarine Boats		
Sundry Small Craft		
Fuel and Stores, Machines, Tools, and Plant for maintenance of Ships; Materials and Labour . .	185,185	161,111
Total . . . £	3,653,946	3,603,694

EXTRAORDINARY EXPENDITURE.

	£	£
General Expenses and Half Pay	2,853	3,662
Expenditure on New Construction	193,575	250,728
Coast Defence and Fortifications.	7,407	7,407
Torpedoes	7,407	3,703
Total . . . £	211,242	265,500

SUMMARY.

	£	£
Ordinary Expenditure—General Expenses	616,289	612,285
Expenditure for Naval Services.	3,653,946	3,603,694
Extraordinary Expenditure	211,242	265,500
Depreciation of Ships in Commission.	129,629	129,629
Rent of Lands occupied by Government	99,324	98,740
Grand Total . . £	4,710,430	4,709,848

Russian Navy Estimates, 1903.

(Converted at £1 = 9·6 Roubles.)

Heads of Expenditure.	1903.	1902.
	£	£
Central and Ports Administration Salaries and Assistance	253,984	307,922
Educational	122,448	117,566
Medical Establishment and Services	131,920	126,570
Pay of Officers and Seamen Victualling and Clothing	1,209,224	1,110,192
Expenses of Ships in Commission	2,235,699	2,127,604
Hydrographic Department Building and Maintenance of Lighthouses	159,897	126,200
Survey of Mouths of Yenesei and Obi	5,698	5,698
New Construction, Armaments, Repairs and Refits	4,213,508	3,865,194
Admiralty Yards and Workshops	596,238	597,971
Buildings, Rents, and Repairs	543,372	589,583
Allowance for transport, &c.	155,453	88,437
Various Expenses	203,266	186,215
Works at Port Alexander III.	244,691	419,452
Improvement of Vladivostock	331,411	208,333
Improvement and Fortification of Port Arthur	427,604	333,333
New Dock on Galerny Island	42,437	——
Expenditure on account of Next Year's Estimates	——	31,291
Total £	10,876,850	10,241,561

United States Navy Estimates, 1903 and 1904.

(Converted at £1 = $4·8665, Par, as adopted by Congress).

Detailed objects of Expenditure and Appropriation.	Appropriations, 1903.	Estimates, 1904.	Appropriations, 1904.
	£	£	£
Pay of the Navy . . .	3,316,181	3,515,071	3,638,363
Pay, Miscellaneous . . .	123,292	123,292	123,292
Contingent, Navy . . .	2,055	2,055	3,082
Emergency Fund . . .	20,549	20,549	8,220
Bureau of Navigation . .	266,038	237,773	323,790
" Ordnance . . .	638,858	567,349	628,995
" Equipment. . .	1,090,393	1,236,740	1,113,450
" Yards and Docks .	153,860	155,945	153,890
Public Works—			
Bureau of Yards and Docks .	1,571,831	1,194,788	772,206
" Navigation, including Naval Academy, Training Stations, and War College . . .	145,027	254,032	60,875
" Ordnance . . .	80,592	86,674	25,028
" Naval Observatory .	1,027	——	1,027
Bureau of Medicine and Surgery.	63,701	99,661	104,798
" Supplies and Accounts	781,655	791,940	791,940
" Construction and Repairs	1,764,270	1,719,310	1,719,310
" Steam Engineering .	781,445	823,569	803,020
Naval Academy . . .	47,242	58,379	55,358
Marine Corps	654,771	661,289	692,111
Increase of Navy . . .	4,701,126	5,389,014	5,224,625
Total . . .	£16,203,913	£16,937,430	£16,243,380

The Conditions of Service in Different Navies.

Country.	Length of Service.	
	Active Service.	Reserve.
Great Britain* . .	12 years	Not compulsory, but will be in 10 years' time; inducements are offered
France	47 months, with 13 months on leave	2 years in First Reserve, and 25 years in Second Reserve
Russia	5 to 7 years	8 to 10 years in reserve
Germany . . .	3 years	4 years in reserve, and then join the *Seewehr* until 40 years of age
Italy	4 years	8 years in reserve, and then 7 years in militia, but there does not appear to be any training subsequent to active service
Austria	4 years	?
The United States .	4 years	?
Japan	Volunteers, 8 years Conscripts, 4 years	4 years 3 years in First Reserve; 5 years in Second Reserve

* In 1903–4 it was proposed to enter 25 per cent. of the men for short service with the remainder of their 12 years in the reserve.

Approximate Numbers of the *Personnel* on Active Service and in Reserve.

Country.	Numbers on Active Service.	Numbers in Reserve.
Great Britain . .	On January 1, 1903— 122,666 *	On January 1, 1903:— Royal Naval Reserve . . 26,559 Royal Fleet Reserve . . 9,003 Pensioners . . . . . 5,978 Total 41,540
France	53,247	49,346 §
Russia †	65,054	About 30,000
Germany . . .	33,542	Four years in Reserve, 5,114; the remainder liable to serve bring the numbers up to over 70,000
Italy ‡	26,948	33,667
Austria	10,841	Not known
The United States‖.	29,838	A Reserve is being formed
Japan	About 31,000	About 4,000

* In the Estimates 1903-4 the number voted for active service was 127,100. It is of little use to quote the number voted for reserves, as for several years past expectations have not been realised.

† Estimates 1903–4.

‡ The reserve is of doubtful efficiency. Many of the officers are over 60 years old.

§ Nominally the reserves available under the Inscription Maritime are over double the above figures, but in this case men who are medically unfit or too old are included.

‖ The number credited to the United States includes 7010 Marines.

SUMMARY OF ADMIRALTY CIRCULAR, MARCH 28, 1903, CONCERNING THE NEW NAVAL SCHEME WHICH IS IN FORCE FROM APRIL 1, 1903.

Mechanical training for seamen.

The ordinary seamen are to be examined and to be trained in the following :—

(1.) The use of simple tools (under a chief or leading stoker) and working at watertight doors, sluices, fire-mains, ventilation system, etc., as convenient.

(2.) Training in stokehold work—

(*a*) Ordinary stokehold day work—sweeping tubes and backs, cleaning, etc.

(*b*) Bunker work and firing—alternate watches at the two duties.

(*c*) Firing, cleaning fires, and general stokehold watch-keeping.

(*d*) In ships with cylindrical boilers, part of (*c*) is to be carried out in picket or other boat fitted with water-tube boiler.

The simple mechanical tools which an ordinary seaman must understand how to use before he is qualified to be rated able seaman are—

Use of levers.

Jacks; Purchases, Weston's and others; also the use of Spanish windlass.

Use of hammers, both hand and sledge.

Drifts and punches, brace and bits, ratchet-brace, screw-driver, spanners, tommies, wedges, files, hatchet and chisel.

Physical drill.

Systematic courses of physical training for the young officers and seamen are to be established. In the training ships for boys "physical and mechanical training is to be largely substituted for mast and sail drill and such other drills as are not suited for the training of a modern seaman."

Gunnery training.

The training of the lower gunnery and torpedo ratings is to be carried out more at sea and at the barracks, "and thereby leave the schools more free to perfect the instruction of the higher ratings."

Boy artificers.

The boy artificers will be taken principally by open competition, but a limited number of nominated candidates—not exceeding fifteen annually—will be entered after passing a qualifying examination. The nominees will be selected by the Admiralty from the sons of certain ratings in the Navy and dockyards. They will be trained for four years in the Fleet Reserve, and then go to sea, ranking as second-class petty officers. On reaching the age of twenty-one years,

and having completed five years' training, they will be given the rank of E.R.A., Fourth Class. They are to receive pay from the commencement of their training, so that the scheme is calculated to be very costly, as special ships are also to be prepared for their reception.

Chief artificer engineers.

The commissioned rank is to be conceded to the artificer engineer class, on a similar footing as regards promotion to that of the other warrant-officers' classes.

Engineer officers.

It is explicitly stated that "whilst the assumption of the new titles does not affect generally the status of the engineer officers, it will facilitate the fusion that must take place when the lieutenants (E), under the new scheme, come into the service.

The training of naval cadets.

The following paragraph marks the practical abandonment by the Admiralty of the four years' college course, followed by a period in a training ship, mentioned in Lord Selborne's original memorandum :

"Arrangements have been made for providing all the necessary means for giving practical sea-going instruction in engineering, navigation, and the other portions of an officer's duties to the cadets during their instructional course, and further, careful consideration is being given to apportioning such time as is desirable to instruction in a sea-going training ship either during or towards the end of the first four years of the cadet's period of service. The experience in the Isis has shown the great value of such an arrangement—either during or subsequent to the cadets' course. Cadets failing to qualify by satisfying the tests of progress at the end of each of the first four years, or judged for any reason to be unsuitable, will be withdrawn from the service. The question of the courses of instruction at Greenwich, Portsmouth, and Keyham, when the cadets reach sub-lieutenant's rank, will receive a further careful examination, with the view of making a more effective use of the time to be spent at those shore establishments. It is hoped to obviate the necessity that exists under present arrangements for devoting so much time to these courses of instruction, which have the ill effect of congregating a very large body of young officers at shore establishments for a lengthened period at a time of their service which would be more profitably spent at sea."

The training at sea under the new proposals is to come out of the four years' courses.

Gunnery and torpedo lieutenants.

It is proposed to shorten the courses of the specialist officers as they involve a withdrawal of two years from the sea. Navigating lieutenants are to receive practical training in a sea-going ship.

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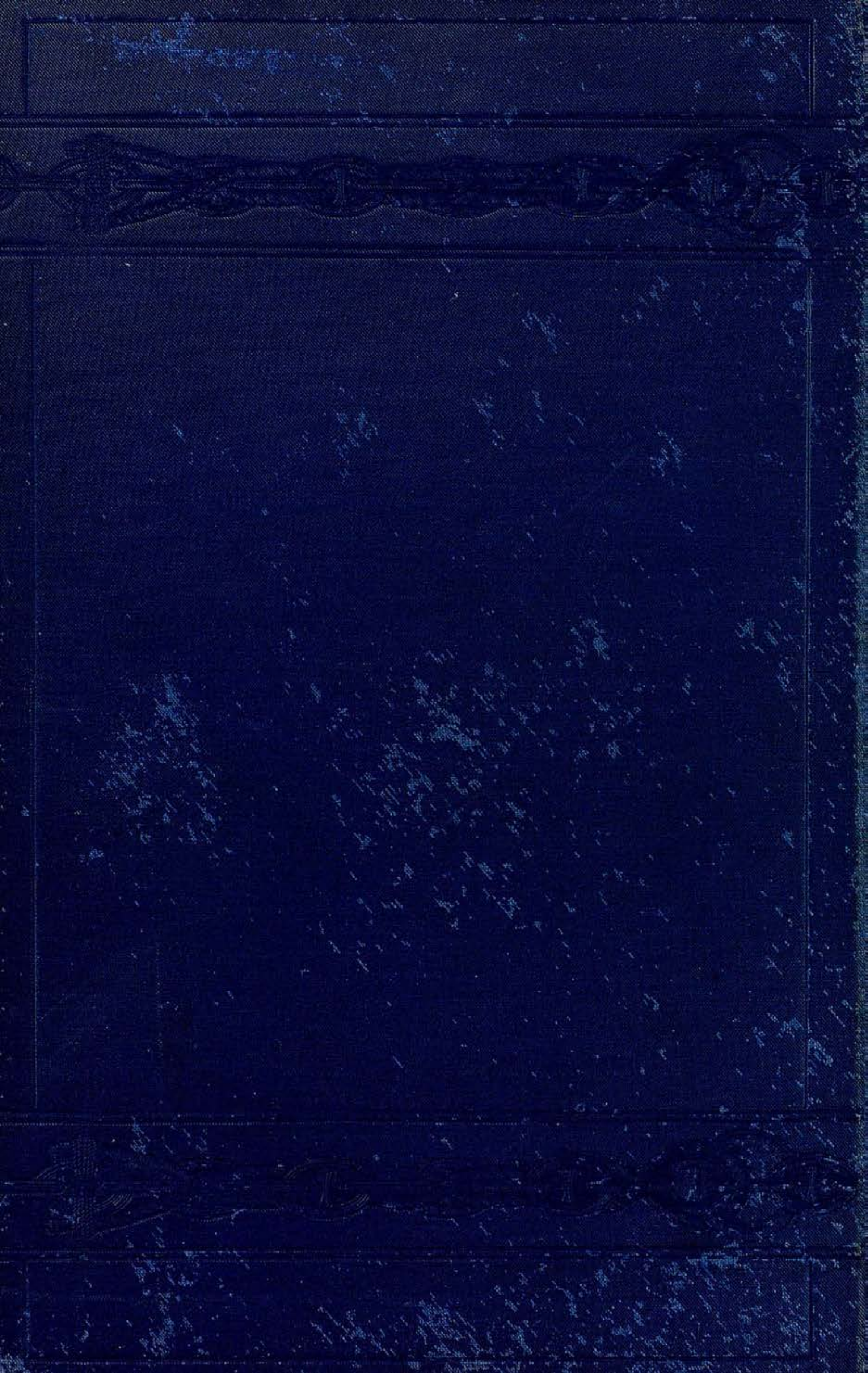
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